

# BACKGROUND GEOCHEMICAL CHARACTERIZATION REPORT

**Rocky Flats Plant  
for 1989**

U.S. DEPARTMENT OF ENERGY  
Rocky Flats Plant  
Golden, Colorado

**21 DECEMBER 1990**

**EG&G Rocky Flats, Inc.  
Golden, Colorado**

**ADMIN RECORD**

SW-A-000017

**FINAL**

UCNI  
CLASSIFICATION  
By John C. Greengard (U)  
Date 12/17/90

"REVIEWED FOR CLASSIFICATION"

By [Signature]

Date [Signature]

**BACKGROUND GEOCHEMICAL CHARACTERIZATION REPORT  
FOR 1989**

**ROCKY FLATS PLANT  
GOLDEN, COLORADO**

**Prepared for:**

**U.S. Department of Energy  
Rocky Flats Plant  
Golden, Colorado 80401**

**Prepared by:**

**EG&G Rocky Flats, Inc.  
P.O. Box 464  
Golden, Colorado 80402**

**DECEMBER 21, 1990**

UCN1  
"REVIEWED FOR CLASSIFICATION"  
By Isabel C. [signature]  
Date 12/17/90 (U)

[signature] 2-22-91

"REVIEWED FOR CLASSIFICATION"  
By [signature]  
Date 12/17/90

# BACKGROUND GEOCHEMICAL CHARACTERIZATION REPORT FOR 1989

## TABLE OF CONTENTS

| <u>SECTION</u> | <u>TITLE</u>                                     | <u>PAGE</u> |
|----------------|--|-------------|
| 1              | EXECUTIVE SUMMARY                                | 1-1         |
| 2              | INTRODUCTION AND PURPOSE                         | 2-1         |
| 2 1            | Introduction                                     | 2-1         |
| 2 2            | Background                                       | 2-2         |
| 2 3            | General Approach                                 | 2-3         |
| 2 4            | Statistical Approach and Methods                 | 2-3         |
| 2 4 1          | Comparisons Between Groups                       | 2-4         |
| 2 4 2          | Calculation of Tolerance Intervals               | 2-9         |
| 2 4 3          | Radiochemistry Statistics                        | 2-12        |
| 2 4 4          | Seasonality                                      | 2-13        |
| 2 4 5          | Comparison of Background and Non-Background Data | 2-13        |
| 3              | SAMPLING LOCATIONS AND SAMPLE COLLECTION         | 3-1         |
| 3 1            | Ground Water                                     | 3-1         |
| 3 1 1          | Rocky Flats Alluvial Ground Water                | 3-5         |
| 3 1 2          | Colluvial Ground Water                           | 3-6         |
| 3 1 3          | Valley Fill Alluvial Ground Water                | 3-6         |
| 3 1 4          | Bedrock Ground Water                             | 3-6         |
| 3 2            | Surface Water                                    | 3-7         |
| 3 3            | Stream Sediment                                  | 3-8         |
| 3 4            | Borehole Samples                                 | 3-8         |
| 4              | DATA QUALITY                                     | 4-1         |
| 4 1            | Quality Assurance/Quality Control Practices      | 4-1         |
| 4 2            | Status of Data Validation                        | 4-2         |
| 4 3            | Field Quality Control Samples                    | 4-4         |
| 4 4            | Identification of Outliers                       | 4-6         |
| 4 5            | Geochemical Data Quality Criteria                | 4-7         |
| 4 5 1          | Ground Water Quality Criteria                    | 4-7         |
| 4 5 2          | Surface Water Quality Criteria                   | 4-18        |

## BACKGROUND GEOCHEMICAL CHARACTERIZATION REPORT FOR 1989

### TABLE OF CONTENTS (continued)

| <u>SECTION</u> | <u>TITLE</u>                            | <u>PAGE</u> |
|----------------|---|-------------|
| 5              | BACKGROUND GEOCHEMICAL CHARACTERIZATION | 5-1         |
| 5 1            | Introduction                            | 5-1         |
| 5 2            | Ground Water                            | 5-1         |
| 5 2 1          | Statistics                              | 5-1         |
| 5 2 2          | Major Ion Geochemistry                  | 5-4         |
| 5 2 3          | Tolerance Intervals                     | 5-15        |
| 5 3            | Surface Water                           | 5-16        |
| 5 3 1          | Statistics                              | 5-16        |
| 5 3 2          | Major Ion Geochemistry                  | 5-18        |
| 5 3 3          | Surface Water Geochemistry              | 5-22        |
| 5 3 4          | Tolerance Intervals                     | 5-28        |
| 5 4            | Sediments                               | 5-28        |
| 5 4 1          | Statistics                              | 5-28        |
| 5 4 2          | Tolerance Intervals                     | 5-30        |
| 5 5            | Borehole Materials                      | 5-30        |
| 5 5 1          | Statistics                              | 5-30        |
| 5 5 2          | Tolerance Intervals                     | 5-33        |
| 6              | REFERENCES                              | 6-1         |

### LIST OF APPENDICES

| <u>APPENDIX</u> | <u>TITLE</u>                          |
|-----------------|---------------------------------------|
| A               | FIELD AND ANALYTICAL DATA             |
| B               | TOLERANCE INTERVAL CALCULATIONS       |
| C               | LIST OF OUTLIERS FOR ALL SAMPLE MEDIA |
| D               | DATA VALIDATION SUMMARY               |

## BACKGROUND GEOCHEMICAL CHARACTERIZATION REPORT FOR 1989

### LIST OF PLATES

| <u>PLATE</u> | <u>TITLE</u>   |
|--------------|--|
| 1            | Individual Hazardous Substance Sites Location and 1989 Background Surface Water, Sediment, Borehole, and Monitoring Well Locations |
| 2            | Surficial Geology Map for the Rocky Flats Plant and Buffer Zone  |
| 3            | Stiff Diagrams for Background Ground Water and Surface Water in 1989   |

### LIST OF FIGURES

| <u>FIGURE</u> | <u>TITLE</u>  | <u>PAGE</u> |
|---------------|---|-------------|
| 2-1           | Methodology for Computation of Background Statistics  | 2-5         |
| 2-2           | Methods for Comparing Non-Background with Background Data   | 2-14        |
| 3-1           | Schematic of Ground Water/Surface Water Interaction   | 3-2         |
| 3-2           | Potentiometric Surface for Upper Flow System<br>for First Quarter, 1990                                   | 3-4         |
| 4-1           | Cation-Anion Balance in Ground Water  | 4-8         |
| 4-2           | Charge Balance Error versus Total Dissolved Solids in Ground Water  | 4-10        |
| 4-3           | Comparison of Measured and Calculated Total Dissolved<br>Solids in Ground Water                           | 4-11        |
| 4-4           | Specific Conductance vs Total Dissolved Solids in Ground Water  | 4-12        |
| 4-5           | Comparison of Field-Measured pH vs Laboratory-Measured pH<br>in Ground water                              | 4-13        |
| 4-6           | Histogram of Field-Measured pH in Ground Water  | 4-15        |
| 4-7           | Scattergram of Filtered vs Unfiltered Alkalinity for 50 Wells, 1990 0                                     | 4-16        |
| 4-8           | Comparison Between Filtered and Unfiltered Total Alkalinity<br>Measurements for Selected Background Wells | 4-17        |
| 4-9           | Cation-Anion Balance in Surface Water   | 4-19        |
| 4-10          | Charge Balance Error vs Total Dissolved Solids in Surface Water   | 4-20        |
| 4-11          | Comparison of Measured and Calculated Total Dissolved<br>Solids in Surface Water                          | 4-21        |

## BACKGROUND GEOCHEMICAL CHARACTERIZATION REPORT FOR 1989

### LIST OF FIGURES (continued)

| <u>FIGURE</u> | <u>TITLE</u>   | <u>PAGE</u> |
|---------------|--|-------------|
| 4-12          | Specific Conductance vs Total Dissolved Solids in Surface Water  | 4-22        |
| 4-13          | Comparison of Field-Measured pH vs Laboratory-Measured pH in Surface Water   | 4-23        |
| 4-14          | Histogram and Probability Plot of Field-Measured pH in Surface Water   | 4-25        |
| 5-1           | Trilinear Diagram for Rocky Flats Alluvium Ground Water 1989   | 5-5         |
| 5-2           | Trilinear Diagram for Valley Fill Alluvium Ground Water 1989   | 5-6         |
| 5-3           | Trilinear Diagram for Colluvium Ground Water 1989  | 5-7         |
| 5-4           | Trilinear Diagram for Weathered Sandstone and Claystone Ground Water 1989  | 5-8         |
| 5-5           | Trilinear Diagram for Unweathered Sandstone Ground Water 1989  | 5-9         |
| 5-6           | Plot Showing Changes in Concentration with Distance Downgradient for Valley Fill in the North Buffer Zone                | 5-11        |
| 5-7           | Plot Showing Changes in Concentration with Distance Downgradient for Rocky Flats Alluvium Wells in the North Buffer Zone | 5-12        |
| 5-8           | Plot Showing Changes in Concentration with Distance Downgradient for Valley Fill in the South Buffer Zone                | 5-13        |
| 5-9           | Plot Showing Changes in Concentration with Distance Downgradient for Weathered Claystone in the North Buffer Zone        | 5-14        |
| 5-10          | Concentration vs Distance for Major Anions for Surface Water in Rock Creek   | 5-19        |
| 5-11          | Concentration vs Distance for Major Cations in Surface Water in Rock Creek   | 5-20        |
| 5-12          | Trilinear Diagram for all 1989 Surface Water Samples   | 5-21        |
| 5-13          | Plot Comparing TSS with Total Metals at SW080  | 5-24        |
| 5-14          | Plot Comparing TSS with Total Metal at SW104   | 5-25        |
| 5-15          | Plot Comparing TSS with Total Radionuclides at SW080   | 5-26        |
| 5-16          | Plot Comparing TSS with Total Radionuclides for SW104  | 5-27        |

## BACKGROUND GEOCHEMICAL CHARACTERIZATION REPORT FOR 1989

### LIST OF TABLES

| <u>TABLE</u> | <u>TITLE</u>  | <u>PAGE</u> |
|--------------|---|-------------|
| 2-1          | Tolerance Factors for Normal Tolerance Limits for 95% Population at 95% Confidence                              | 2-17        |
| 2-2          | Values of Lambda for Estimating the Mean and Variance of a Normal Distribution Using the Method of Cohen (1961) | 2-18        |
| 3-1          | Well and Borehole Data for Background Ground Water Monitoring Wells and Boreholes at Rocky Flats Plant          | 3-11        |
| 3-2          | Analyte List for Background Surface and Ground Water Samples  | 3-14        |
| 3-3          | Background Surface Water and Sediment Station Descriptions for Rocky Flats Plant                                | 3-16        |
| 3-4          | Analyte List for Background Sediment Samples  | 3-17        |
| 3-5          | Background Borehole Sample Information  | 3-18        |
| 3-6          | Analyte List for Background Borehole Material Samples   | 3-22        |
| 5-1          | Statistical Comparison Chart for Ground Water Dissolved Metals  | 5-34        |
| 5-2          | Statistical Comparison Chart for Ground Water Dissolved Radionuclides   | 5-36        |
| 5-3          | Statistical Comparison Chart for Ground Water Inorganics  | 5-37        |
| 5-4          | Statistical Comparison Chart for Surface Water  | 5-38        |
| 5-5          | Statistical Comparison Chart for Sediments  | 5-39        |
| 5-6          | Statistical Comparison Chart for Boreholes Total Metals   | 5-40        |
| 5-7          | Statistical Comparison Chart for Boreholes Total Radionuclides  | 5-42        |
| 5-8          | Comparison of Mean TDS for Ground Water Subgroups   | 5-43        |
| 5-9          | Comparison of TDS and TSS Between Stream Channel and Seep Surface Water Stations                                | 5-44        |
| 5-10         | Statistics for Dissolved Metal Concentrations in Background Rocky Flats Alluvial Ground Water Samples           | 5-45        |
| 5-11         | Statistics for Inorganic Concentrations in Background Rocky Flats Alluvial Ground Water Samples                 | 5-46        |

## BACKGROUND GEOCHEMICAL CHARACTERIZATION REPORT FOR 1989

### LIST OF TABLES (Continued)

| <u>TABLE</u> | <u>TITLE</u>   | <u>PAGE</u> |
|--------------|--|-------------|
| 5-12         | Statistics for Inorganic Concentrations in Background<br>North Rocky Flats Rocky Flats Alluvial Ground Water Samples | 5-47        |
| 5-13         | Statistics for Inorganic Concentrations in Background<br>South Rocky Flats Rocky Flats Alluvial Ground Water Samples | 5-48        |
| 5-14         | Statistics for Dissolved Radiochemical Concentrations in<br>Background Rocky Flats Alluvial Ground Water Samples     | 5-49        |
| 5-15         | Statistics for Dissolved Metal Concentrations in Background<br>Colluvial Ground Water Samples                        | 5-50        |
| 5-16         | Statistics for Inorganic Concentrations in Background<br>Colluvial Ground Water Samples                              | 5-51        |
| 5-17         | Statistics for Inorganic Concentrations in Background<br>North Rocky Flats Colluvial Ground Water Samples            | 5-52        |
| 5-18         | Statistics for Inorganic Concentrations in Background<br>South Rocky Flats Colluvial Ground Water Samples            | 5-53        |
| 5-19         | Statistics for Dissolved Radiochemical Concentrations in<br>Background Colluvial Ground Water Samples                | 5-54        |
| 5-20         | Statistics for Dissolved Metal Concentrations in Background<br>Valley Fill Alluvial Ground Water Samples             | 5-55        |
| 5-21         | Statistics for Inorganic Concentrations in Background<br>Valley Fill Alluvial Ground Water Samples                   | 5-56        |
| 5-22         | Statistics for Inorganic Concentrations in Background<br>North Rocky Flats Valley Fill Alluvial Ground Water Samples | 5-57        |
| 5-23         | Statistics for Inorganic Concentrations in Background<br>South Rocky Flats Valley Fill Alluvial Ground Water Samples | 5-58        |
| 5-24         | Statistics for Dissolved Radiochemical Concentrations in<br>Background Valley Fill Alluvial Ground Water Samples     | 5-59        |
| 5-25         | Statistics for Dissolved Metal Concentrations in<br>Background Weathered Claystone Ground Water Samples              | 5-60        |
| 5-26         | Statistics for Inorganic Concentrations in Background<br>Weathered Claystone Ground Water Samples                    | 5-61        |
| 5-27         | Statistics for Inorganic Concentrations in Background<br>North Rocky Flats Weathered Claystone Ground Water Samples  | 5-62        |

## BACKGROUND GEOCHEMICAL CHARACTERIZATION REPORT FOR 1989

### LIST OF TABLES (Continued)

| <u>TABLE</u> | <u>TITLE</u>   | <u>PAGE</u> |
|--------------|--|-------------|
| 5-28         | Statistics for Inorganic Concentrations in Background<br>South Rocky Flats Weathered Claystone Ground Water Samples    | 5-63        |
| 5-29         | Statistics for Dissolved Radiochemical Concentrations in<br>Background Weathered Claystone Ground Water Samples        | 5-64        |
| 5-30         | Statistics for Dissolved Metal Concentrations in Background<br>Weathered Sandstone Ground Water Samples                | 5-65        |
| 5-31         | Statistics for Inorganic Concentrations in Background<br>Weathered Sandstone Ground Water Samples                      | 5-66        |
| 5-32         | Statistics for Inorganic Concentrations in Background<br>South Rocky Flats Weathered Sandstone Ground Water Samples    | 5-67        |
| 5-33         | Statistics for Dissolved Radiochemical Concentrations in<br>Background Weathered Sandstone Ground Water Samples        | 5-68        |
| 5-34         | Statistics for Dissolved Metal Concentrations in Background<br>Unweathered Sandstone Ground Water Samples              | 5-69        |
| 5-35         | Statistics for Inorganic Concentrations in Background<br>Unweathered Sandstone Ground Water Samples                    | 5-70        |
| 5-36         | Statistics for Inorganic Concentrations in Background<br>North Rocky Flats Unweathered Sandstone Ground Water Samples  | 5-71        |
| 5-37         | Statistics for Inorganic Concentrations in Background<br>South Rocky Flats Unweathered Sandstone Ground Water Samples  | 5-72        |
| 5-38         | Statistics for Dissolved Radiochemical Concentrations in<br>Background Unweathered Sandstone Ground Water Samples      | 5-73        |
| 5-39         | Statistics for Dissolved Metal Concentrations in Background<br>Upper Most Flow System Ground Water Samples             | 5-74        |
| 5-40         | Statistics for Dissolved Metal Concentrations in Background<br>Lower Most Flow System Ground Water Samples             | 5-75        |
| 5-41         | Statistics for Inorganic Concentrations in Background<br>Upper Most Flow System Ground Water Samples                   | 5-76        |
| 5-42         | Statistics for Inorganic Concentrations in Background<br>Lower Most Flow System Ground Water Samples                   | 5-77        |
| 5-43         | Statistics for Inorganic Concentrations in Background<br>North Rocky Flats Upper Most Flow System Ground Water Samples | 5-78        |

## BACKGROUND GEOCHEMICAL CHARACTERIZATION REPORT FOR 1989

### LIST OF TABLES (Continued)

| <u>TABLE</u> | <u>TITLE</u>   | <u>PAGE</u> |
|--------------|--|-------------|
| 5-44         | Statistics for Inorganic Concentrations in Background<br>North Rocky Flats Lower Most Flow System Ground Water Samples | 5-79        |
| 5-45         | Statistics for Inorganic Concentrations in Background<br>South Rocky Flats Upper Most Flow System Ground Water Samples | 5-80        |
| 5-46         | Statistics for Inorganic Concentrations in Background<br>South Rocky Flats Lower Most Flow System Ground Water Samples | 5-81        |
| 5-47         | Statistics for Dissolved Radiochemical Concentrations in Background<br>Upper Most Flow System Ground Water Samples     | 5-82        |
| 5-48         | Statistics for Dissolved Radiochemical Concentrations in Background<br>Lower Most Flow System Ground Water Samples     | 5-83        |
| 5-49         | Statistics for Total Metal Concentrations in Background<br>Surface Water Samples                                       | 5-84        |
| 5-50         | Statistics for Total Metal Concentrations in Background<br>North Rocky Flats Surface Water Samples                     | 5-85        |
| 5-51         | Statistics for Total Metal Concentrations in Background<br>South Rocky Flats Surface Water Samples                     | 5-86        |
| 5-52         | Statistics for Dissolved Metal Concentrations in Background<br>Surface Water Samples                                   | 5-87        |
| 5-53         | Statistics for Dissolved Metal Concentrations in Background<br>North Rocky Flats Surface Water Samples                 | 5-88        |
| 5-54         | Statistics for Dissolved Metal Concentrations in Background<br>South Rocky Flats Surface Water Samples                 | 5-89        |
| 5-55         | Statistics for Inorganic Concentrations in Background<br>Surface Water Samples   | 5-90        |
| 5-56         | Statistics for Total Radiochemical Concentrations in Background<br>Surface Water Samples                               | 5-91        |
| 5-57         | Statistics for Total Metal Concentrations in Background<br>Sediment Samples  | 5-92        |
| 5-58         | Statistics for Inorganic Concentrations in Background<br>Sediment Samples  | 5-93        |
| 5-59         | Statistics for Total Radiochemical Concentrations in Background<br>Sediment Samples                                    | 5-94        |

**BACKGROUND GEOCHEMICAL CHARACTERIZATION REPORT FOR 1989**  
**LIST OF TABLES**  
**(Continued)**

| <b><u>TABLE</u></b> | <b><u>TITLE</u></b>   | <b><u>PAGE</u></b> |
|---------------------|---|--------------------|
| 5-60                | Statistics for Total Metal Concentrations in Background Rocky Flats Alluvial Borehole Samples   | 5-95               |
| 5-61                | Statistics for Total Metal Concentrations in Background North Rocky Flats Alluvial Borehole Samples   | 5-96               |
| 5-62                | Statistics for Total Metal Concentrations in Background South Rocky Flats Rocky Flats Alluvial Borehole Samples                                   | 5-97               |
| 5-63                | Statistics for Inorganic Concentrations in Background Rocky Flats Alluvial Borehole Samples   | 5-98               |
| 5-64                | Statistics for Inorganic Concentrations in Background North Rocky Flats Rocky Flats Alluvial Borehole Samples                                     | 5-99               |
| 5-65                | Statistics for Inorganic Concentrations in Background South Rocky Flats Rocky Flats Alluvial Borehole Samples                                     | 5-100              |
| 5-66                | Statistics for Total Radiochemical Concentrations in Background Rocky Flats Alluvial Borehole Samples   | 5-101              |
| 5-67                | Statistics for Total Metal Concentrations in Background Colluvial, Weathered Claystone and Weathered Sandstone Borehole Samples                   | 5-102              |
| 5-68                | Statistics for Total Metal Concentrations in Background North Rocky Flats Colluvial, Weathered Claystone and Weathered Sandstone Borehole Samples | 5-103              |
| 5-69                | Statistics for Total Metal Concentrations in Background South Rocky Flats Colluvial, Weathered Claystone and Weathered Sandstone Borehole Samples | 5-104              |
| 5-70                | Statistics for Inorganic Concentrations in Background Colluvial, Weathered Claystone and Weathered Sandstone Borehole Samples                     | 5-105              |
| 5-71                | Statistics for Inorganic Concentrations in Background North Rocky Flats Colluvial, Weathered Claystone and Weathered Sandstone Borehole Samples   | 5-106              |
| 5-72                | Statistics for Inorganic Concentrations in Background South Rocky Flats Colluvial, Weathered Claystone and Weathered Sandstone Borehole Samples   | 5-107              |
| 5-73                | Statistics for Total Radiochemical Concentrations in Background Colluvial, Weathered Claystone and Weathered Sandstone Borehole Samples           | 5-108              |

## SECTION 1

### EXECUTIVE SUMMARY

In order to monitor for environmental degradation which may have resulted from past work practices at Rocky Flats Plant (RFP), it is necessary to know the chemistry of environmental materials from areas near the plant which are undisturbed by plant operations. These undisturbed, or background locations are characterized by analyzing environmental materials collected at a number of representative sampling sites. The resulting chemical data are summarized by statistics which provide a basis for comparison with chemical results from non-background areas of RFP to help identify and assess potential environmental contamination.

This report describes and summarizes background geochemical data collected during calendar year 1989 under the Background Geochemical Characterization Program at RFP. It incorporates data that were not available for the draft report delivered to the U S Environmental Protection Agency (EPA) and to the Colorado Department of Health (CDH) on December 15, 1989, and includes two additional quarters of ground water data and seven additional rounds of surface water data.

The geochemistry of surface water, stream sediments, ground water and borehole materials are discussed in the report. The samples were collected at stations located in Buffer Zone areas west, north and south of the main plant. The samples were analyzed for chemical constituents including radioactive isotopes, EPA target analyte list (TAL) metals, major anions and indicator parameters such as pH, specific conductance (SC), and total dissolved solids (TDS).

Chemical data for each sample medium are classified into groups by geographic location (all media) and by lithology (ground water and boreholes), and summary statistics are computed for each group. Statistical methods used to define the groups include multivariate analysis of variance (MANOVA), parametric and non-parametric analysis of variance (ANOVA), multiple comparisons testing, and tests of proportions. The application of each statistical procedure is discussed in this report. Various summary statistics are computed

for each chemical data set within each group including mean, standard deviation, upper tolerance limit (upper and lower for pH), maximum concentration, sample size, and percentage of detectable concentrations

As presented in the Background Geochemical Characterization Plan (Rockwell, 1989), tolerance intervals are the principal statistics used to characterize the chemistry of background stations at RFP. Tolerance intervals are computed assuming normality or lognormality for chemicals that have greater than 50% detectable (above detection limit) concentrations, and a minimum of four detectable concentrations. The maximum detected value and other descriptive statistics are provided when there are insufficient data to calculate a tolerance interval.

Ground water samples collected from wells completed in Rocky Flats Alluvium, valley fill, colluvium, and weathered and unweathered bedrock were compared with each other. Wells located in North Rocky Flats were compared against wells from South Rocky Flats. (The ground water divide between the Walnut and Woman Creek drainages separates North and South Rocky Flats). Similarly, borehole samples from the different lithologic units present at Rocky Flats were tested against each other. Surface water and sediment samples collected in North Rocky Flats were compared with samples from South Rocky Flats.

The majority of chemicals for which more than 50% of analyses were above detection in ground water samples, show a statistical difference in chemistry between the lithologies in which the wells are completed: Rocky Flats Alluvium, colluvium, valley fill alluvium, weathered claystone, weathered sandstone, and unweathered sandstone. However, except for chloride, geography does not influence ground water chemistry. Tolerance intervals and summary statistics are computed for each distinctive ground water-bearing unit.

For surface waters, North and South Rocky Flats differ only in Ca, Li, and Na concentrations. All other analytes have similar concentrations in the surface water from both locations so that only one set of tolerance intervals and summary statistics is computed.

All chemicals in sediment samples show no statistical difference between North and South Rocky Flats, so one set of statistics is calculated per analyte for the entire RFP

Rocky Flats Alluvium borehole materials are chemically different from all other units. Colluvium, valley fill and weathered bedrock are chemically similar and are therefore combined into one lithologic group. In addition, samples from boreholes drilled in North and South Rocky Flats appear to be statistically different in the mean concentrations of Ca, Cu, Cr, Hg, Li, Mo, Ni, Pb, Sn, V, Zn, and nitrate/nitrite. All other analytes in borehole materials are similar between North and South Rocky Flats.

Ongoing hydrogeological investigations suggest that ground water at Rocky Flats may consist of an upper and a lower flow system. In terms of major ion chemistry, background ground water can be classified into an upper flow system comprised of Rocky Flats Alluvium, valley fill, and weathered bedrock, and a lower flow system in unweathered sandstone. Geochemical plots (Stiff and Piper diagrams) of ground water major ion chemistry indicate that unweathered sandstone ground water is more concentrated in sodium, potassium, chloride and sulfate relative to the other groups, which are primarily bicarbonate to calcium bicarbonate waters. Tolerance intervals and other descriptive statistics are also presented for upper and lower flow system ground waters.

The quality of the ground water chemistry data appears to be good, as indicated by small cation versus anion charge balance errors, averaging only two percent. However, a relatively poor correlation exists between specific conductivity (SC) and total dissolved solids (TDS). The equipment used to measure SC at field sampling locations in 1989 may be responsible for the poor correlation and has since been improved.

Background surface water has low total dissolved solids (TDS) contents and the concentrations of major constituents tend to increase downstream. In contrast, surface water collected at seeps (where ground water emerges) contains higher TDS concentrations, possibly because the emerging water may have had a longer residence time in contact with rock units.

Strong correlations exist between total suspended solids (TSS), total metals, and total radionuclides at two seep stations, SW080 and SW104. Inconsistent sampling techniques may have disturbed the organic and clay-rich sediment at the sites causing the elevated TSS and element concentrations. Chemical analyses of dissolved (water samples filtered in the field) constituents and of sediment samples from the same locations do not indicate elevated metal or radionuclide concentrations relative to the other stations. EG&G is investigating new sampling techniques to minimize sediment disturbance during sampling at seep locations.

It is possible that surface water and ground water chemical concentrations may be influenced by seasonal variations (seasonality). Seasonality effects are not evaluated in this report because only one year of background data has been analyzed, and at least three years of data will be required for such an evaluation.

Data from non-background areas may be compared against the tolerance intervals and other statistics presented in this report to help identify potential areas of chemical contamination from RFP. Analysis of variance, or test of proportions techniques may be used to compare background and non-background data where tolerance intervals are not appropriate.

The Background Geochemical Characterization Report is viewed as a living document which will continue to evolve and improve as additional background data are collected at Rocky Flats. Additional data will increase the reliability of the statistical conclusions, allow the characterization of seasonality, and promote better understanding of trace constituent concentrations. This long term view should result in the clearest possible understanding of background chemistry at Rocky Flats.

## SECTION 2

### INTRODUCTION AND PURPOSE

#### 2.1 INTRODUCTION

In order to monitor for environmental degradation potentially resulting from work activities at Rocky Flats Plant (RFP), it is necessary to characterize the chemistry of environmental materials collected from nearby areas which are undisturbed by plant operations. These undisturbed regions are referred to as background areas. The chemistry of these areas is characterized by sampling and chemically analyzing surface water, stream sediments, ground water and borehole materials at representative sampling locations (see Section 3). The sampling sites are called background stations, or upgradient locations, and are situated in the buffer zone west, north and south of the main plant site.

Representative background analytical data for RFP surface water, sediments, ground water, and borehole materials are necessary to support RCRA facility investigations and CERCLA remedial investigations. Background data assist in the identification of potential environmental contamination by defining the spatial and temporal variability in concentration of naturally occurring constituents. Background characteristics can be compared statistically with data from downgradient sites to determine the likelihood that a particular concentration of chemicals represents a release. Background data generated during this program are applicable to RCRA interim measures CERCLA interim remedial actions (IM/IRAs) so that they are consistent with the final corrective and remedial actions. The final remedial investigation/feasibility study reports and closure plans will incorporate this background information.

This report does the following: (1) describes the statistical methods used to define and characterize background chemical (analyte) distributions at RFP, (2) reports on the first phase of a background hydrogeochemical characterization conducted in 1989 pursuant to the Background Hydrogeochemical Characterization Monitoring Plan (BHCMP) (Rockwell International, 1989a), and (3) describes how these background data may be compared to non-background, or downgradient analytical data.

This report characterizes the chemistry of borehole materials, stream sediments, ground water samples collected quarterly, and surface water samples collected monthly. It supercedes the draft report submitted to EPA and CDH on December 15, 1989, by addressing whether statistically significant differences occur between North Rocky Flats and South Rocky Flats within ground water, surface water, sediments, and borehole materials. The report also addresses whether geochemical differences are discernable between separate, mappable, geologic lithologies and between the ground water contained within these units.

## **2.2 BACKGROUND**

The Rocky Flats Plant (RFP) is a Department of Energy (DOE) facility that manufactures components for nuclear weapons. The Plant fabricates these components from plutonium, uranium, beryllium, and stainless steel. Both radioactive and nonradioactive wastes are generated in the process. Current waste handling practices involve on-site and off-site recycling of hazardous materials and off-site disposal of solid radioactive materials at another DOE facility. Storage and disposal of hazardous and radioactive wastes have occurred in the past and storage is occurring on site. Preliminary assessments under the DOE Comprehensive Environmental Assessment and Response Program (now called the Environmental Restoration (ER) Program) identified past on-site storage and disposal locations as potential sources of environmental contamination.

The ER Program is a comprehensive, phased program of site characterization, environmental monitoring, remedial investigations, risk assessments, feasibility studies, remedial/corrective actions, and site closures. The Program includes CERCLA, RCRA 3004u and RCRA closure projects, and addresses the HSWA provisions of RCRA and the Colorado Hazardous Waste Act. Draft remedial investigation (RI) and feasibility study (FS) reports, and RCRA closure plans have been submitted to EPA and CDH. However, owing to aggressive investigation and clean-up schedules, sufficient background characterization data have not been previously collected. The goal of the background geochemical characterization plan (Rockwell, 1989) and of this report is to provide some of the necessary background data to identify the concentration levels at which various elements and compounds may indicate contamination at RFP.

## **2.3 GENERAL APPROACH**

Samples were collected in different locations across the Rocky Flats Property to characterize background variations within various media: surficial and bedrock materials, stream sediments, ground water, and surface water. In addition, samples were collected within subgroups of some media with different geological and hydrogeological characteristics. For example, ground water was sampled in Rocky Flats Alluvium, colluvium, valley fill, weathered sandstone, weathered claystone, and unweathered sandstone. This report addresses geochemical differences among the subgroups as well as spatial differences within a sample medium between North Rocky Flats and South Rocky Flats (see Section 2.4.1). The following section first discusses the logic and methods for determining differences among subgroups and between different areas, and then discusses appropriate statistical methods for comparing background and non-background samples.

## **2.4 STATISTICAL APPROACH AND METHODS**

A major goal of this report is to establish tolerance intervals and other descriptive statistics for chemicals whose concentrations have been measured in environmental samples collected at background locations at Rocky Flats. Future monitoring activities will use these background statistics as an aid in identifying potential chemical releases to the environment.

All of the statistical computations presented in this report were performed on microcomputers using the commercially available, SAS statistical software package, release 6.03 (SAS Institute, Inc., Cary, NC). Probability plots, histograms and scatterplots were also prepared using GEO-EAS, a geostatistical software package, version 1.2.1 (EPA, 1988).

#### 2 4 1 Comparisons Between Groups

In preparation for the determination of tolerance intervals it is desirable to classify the chemical data into logical groups by sample medium (stream sediment, surface water, ground water, borehole materials) and then to test for statistically significant differences in geochemistry among the members of each group. Analysis of variance (ANOVA) and multivariate analysis of variance (MANOVA) techniques are used for this purpose. Figure 2-1 outlines the logic and the statistical methods used to identify statistical differences between the groups. The classification variables of interest in the present study are spatial location, geologic formation, and date of sampling or seasonality.

The background sampling stations for all environmental media collected at RFP are associated with one of three drainage basins: Rock Creek, Walnut Creek, and Woman Creek (Plate 1). For this reason, the spatial variable was envisioned as a comparison of analyte concentrations between the three drainage basins. However, data were collected in 1989 for only one background station in the Walnut Creek drainage. Therefore, Walnut Creek data were combined with data from the Rock Creek stations to create a "North Rocky Flats" versus "South Rocky Flats" spatial variable. The north-south boundary is defined as the hydrologic ground water divide between the Walnut and Woman Creek drainages and is drawn on Plate 1 based on currently available hydrologic data.

Geologic unit or rock type (lithology) is used to classify samples of borehole materials (rock cuttings and soil). Ground water samples are also classified by the geologic unit in which the well is screened. For example, Rocky Flats Alluvial ground water. This variable can also be viewed as a surrogate for the third spatial dimension in wells and boreholes.

Water chemistry may change seasonally with changes in weather and hydrology. For example, spring runoff and summer thunderstorm events are likely to have an effect on surface water chemistry. Insufficient data are available from 1989 to demonstrate or model seasonality effects at RFP. It is anticipated that three

years of quarterly, or monthly sampling data will be required to adequately address the effects of seasonality on the background chemistry statistics

The desired approach is to use these classification variables in four separate MANOVAs, one per sample medium, to test the null hypothesis that there is no significant difference between the linear combination of mean chemical concentrations when they are compared across each classification variable. For example, using the geologic classification variable, the linear combination of mean concentrations of analytes in Rocky Flats Alluvium may be compared to the mean analyte concentrations in colluvium. If the null hypothesis (of equality) cannot be rejected, then the data from both Rocky Flats Alluvium and colluvium are considered to be similar. The data may then be combined for use in the calculation of a single set of tolerance intervals. However, if MANOVA indicates a statistically significant difference between Rocky Flats Alluvium and colluvium, then ANOVAs and multiple comparison tests are calculated for each individual analyte to identify specific differences between the two groups. Depending on the results of the ANOVAs and multiple comparisons, either all samples of Rocky Flats Alluvium and colluvium are considered to be similar and part of the same population, or they may differ for all or a subset of analytes.

Before MANOVA is invoked, the data are examined for outliers, rejected data are excluded and treated as missing values, and results below the detection limit (nondetects) are transformed to half the detection limit for the analyte (Figure 2-1). Nondetect concentrations provide information that an analyte is not present above the detection limit, but may be present at a concentration between zero and the detection limit. Thus nondetect data are not ignored, but are used along with above detection limit data (detects) in statistical tests. When used in means, standard deviations and statistical tests relying on the magnitude of a concentration, each non-detect is replaced in the calculation by half the actual detection limit.

As shown on Figure 2-1, analytes will ordinarily be included in a MANOVA when they have greater than 50% detectable concentrations, when  $n > 10$ , and when they appear to be either normally, or lognormally distributed as inferred from inspection of probability plots, or from the Shapiro-Wilk test. An exception may be made to include analytes of special geochemical significance in MANOVA procedures when they contain

more than 40% detectable concentrations. When an analyte appears to be lognormally distributed, the log transformed data will be used in the MANOVA.

The present study examines the distributions of the data using a variety of techniques. Probability plots and the Shapiro-Wilk test are used to check normality assumptions. The Kolmogorov-Smirnov test and the chi-squared test are also used. EPA (1989) presents the viewpoint that parametric procedures such as ANOVA tend to be robust with respect to departures from normal distributional assumptions, and they favor the use of parametric methods over weaker nonparametric methods unless the data are shown to clearly violate normality assumptions. It should also be noted that EPA (1989) does not advocate wide scale testing of normality assumptions, but favors the application of parametric methods using either untransformed or log transformed data.

Normal distributional assumptions actually apply to the errors (residuals) in an analysis of variance procedure (EPA, 1989). In ANOVA the residuals are the differences between each observation and the group mean. Thus, normality tests may alternatively be run on the residuals from an ANOVA.

Tests for normality (Shapiro-Wilk) and for homogeneity of variances (Bartlett's test) are performed at a 5% level of significance on the untransformed or log transformed analytical data. If the assumptions of normality are met, and a statistically significant difference in variances exists, then the variance of one location or one lithologic group is probably different from the others. However, when the normality assumption is not met and a significant difference in variances is indicated, the test may be detecting anormality instead of heterogeneity of variances.

A third assumption for the use of parametric ANOVA is that of independence. The locations of background monitoring wells, boreholes, surface water, and sediment sampling stations were selected on geologic and hydrologic considerations, and by taking into account the geographic layout of RFP buildings, plant boundaries, and the locations of identified individual hazardous substance sites (IHSS). Therefore, these sampling stations are not randomly distributed across the plant, but tend to be clustered in several areas (see

Plate 1) Secondly, samples are not drawn at random from these locations, instead they are sampled repeatedly on a periodic basis (except for boreholes) Thus it is acknowledged that the assumption of independence can not be controlled for this data If the assumptions of normality and homogeneity of variances are not met then nonparametric ANOVAs will be performed on the individual analytes Departures from statistical assumptions can effect both the level of significance (type I error rate) and the sensitivity of the F-distribution used in the parametric ANOVA (Steel and Torrie, 1980)

After testing the assumptions of normality and homogeneity of variances, MANOVA is performed on the appropriate data sets (Figure 2-1) As many analytes as possible should be incorporated into MANOVA regardless of their chemical classification In other words, radiochemicals and major ion chemistry may be combined in a MANOVA with trace metals despite the differences in chemistry and reporting units However, if less than 40% of the total number of analytes are available for a sample medium, then MANOVA will not be used and ANOVA methods will be performed on individual analytes As is the case for MANOVA, the analytes used in ANOVAs should still have greater than 50% detectable concentrations and not less than 40% for those of special geochemical interest (Figure 2-1)

Both parametric and nonparametric (Kruskal-Wallis) ANOVAs are performed, as appropriate, for each analyte that is not included in the MANOVA and which contains at least 50% detectable concentrations Both methods should agree when the chemical data are drawn at random from normally distributed parent populations with homogeneous variances However, the nonparametric test result is relied upon, when there are departures from the assumptions of normality and homogeneity of variances Following Figure 2-1, if ANOVA shows no statistically significant difference between classes for an analyte, then the classes are combined, else multiple comparison tests (Bonferroni t-test) are used to explore differences between individual analytes

As stated above, analytes which have fewer than 50% detectable concentrations are classified using a test of proportions (Figure 2-1) As in the MANOVA and ANOVA cases, if the test of proportions fails to show

a significant difference between the members of a classification variable, then the two groups of samples are combined

The MANOVA, ANOVA, and test of proportions methods used in this report all involve statistical hypothesis testing. In the MANOVA and ANOVA cases, the null hypothesis under test is that there is no difference between the mean concentrations of two classes of data being compared. In the test of proportions case, the null hypothesis under test is that the proportions of nondetects are equal between the classes being compared. The type I error rate, or level of significance used for all statistical hypothesis testing in this report is specified at 5%. A type I error is that of incorrectly rejecting a true hypothesis. Assuming that a tested hypothesis is true, the probability that a difference at least as extreme as that actually observed exists, is called the probability value (P-value). If the P-value of a test is less than 5%, a statistically significant difference is observed. P-values are presented for all MANOVA, ANOVA, and test of proportions results (Section 5).

The failure to reject an erroneous hypothesis is called a type II error. When a hypothesis is rejected a type II error can not occur, by definition. However, when a test fails to reject a hypothesis the probability of having made a type II error is generally unknown. Because of the unknown magnitude of the type II error when a test fails, statisticians do not accept the hypothesis as true, but state that the test failed to reject it. Thus, hypothesis testing either rejects the null hypothesis with a known probability of making a type I error, or it fails to reject it with an unknown probability of a type II error.

#### 2.4.2 Calculation of Tolerance Intervals

After MANOVA, ANOVA, and test of proportions procedures have been used to classify the chemical data into groups, the next objective is to calculate tolerance intervals and descriptive statistics such as the mean, standard deviation and percentage of detects.

A tolerance interval may be either one-sided, or two-sided. A two-sided tolerance interval is appropriate when a concentration either larger or smaller than background may be associated with a contaminant release.

The only two-sided tolerance interval in this report is for pH because either extremely low or high pH values may indicate pollution. One-sided upper tolerance intervals are appropriate for all other constituents for which concentrations above background may indicate a chemical release. A two-sided interval is defined by two limits (L1 and L2) where a proportion "p" of the population is contained between L1 and L2 with probability "P". An upper (or lower) one-sided tolerance limit is defined so that p% of the population is less than the upper limit L2, or greater than the lower limit L1. Tolerance intervals in this report are specified to contain 95 percent of the population at the p=95% confidence level (Table 2-1).

Criteria for the use of tolerance intervals based on a normal or lognormal distribution are a 50% or greater rate of detection among samples (EPA, 1989), and a sample of sufficient size to contain at least four detectable concentrations (Figure 2-1). When a tolerance interval can not be computed, only descriptive statistics are reported for the analyte in Section 5.0. Each analyte should be normally distributed to calculate a normal tolerance interval, or lognormally distributed to calculate the lognormal tolerance interval.

An additional complication arises in estimating the mean and variance when the data are assumed to be drawn from a two parameter lognormal distribution. The complication is that the arithmetic mean of the untransformed data is not the minimum variance unbiased (MVU) estimator of the population mean (Gilbert, 1987). The geometric mean is defined as the exponential of the mean of the natural log transformed data and might be used in place of the arithmetic mean. However, the geometric mean is itself a biased estimator of the population mean (Gilbert, 1987). Therefore, in the present report, the mean and variance of lognormal data are estimated using the MVU estimators described by Gilbert (1987). These MVU estimators are computed after applying the Cohen (1961) correction (discussed below) for censored data. MVU estimators for the mean and variance of lognormal data sets are used in tolerance interval calculations and reported in Section 5.

The lower and upper limits of a normal population tolerance interval are computed as

$$L1 = \bar{x} - Ks \text{ and}$$

$$L2 = \bar{x} + Ks,$$

where

$\bar{x}$  = the mean of the sample population of size  $n$ ,

$s$  = standard deviation of the sample population, and

$K$  = the normal tolerance factor (dependent on  $p$ ,  $P$ ,  $n$  and on whether the interval is one or two-sided)

Table 2-1 presents tolerance factors  $K$  for two-sided and one-sided upper tolerance intervals at 95% population and 95% confidence. With the exception of pH, one sided upper tolerance intervals (L2) will be calculated for all analytes.

A data set is censored when not detected (ND) observations are present. A technique for estimating the mean and standard deviation of a censored data set was developed by Cohen (1961) and can be used if the data are normally or lognormally distributed. The Cohen method is not applied if a particular analyte has less than 50% detected values. Also, some analytes in samples of water and borehole materials contained more than one detection limit, complicating or precluding the use of Cohen's method. When applicable, Cohen revised statistics are used in tolerance interval calculations, and as input in the computation of MVU estimators. When the Cohen method is not applicable, the unrevised mean and standard deviation are used.

The Cohen procedure is as follows (Doctor, Gilbert, and Kinnison, 1986)

Let

$n$  = the total number of observations for a constituent,

$k$  = number of actual measurements out of  $n$  (excludes nondetects), and

$x_0$  = the detection limit of the constituent

Then

- 1) Compute  $h = (n-k)/n$  (the proportion of measurements below the detection limit),
- 2) Compute  $\bar{x}_u = (\text{Sum of } x_i \text{ for } i = 1 \text{ to } k)/k$ ,
- 3) Compute  $s^2_u = (\text{Sum of } (x_i - \bar{x}_u)^2 \text{ for } i = 1 \text{ to } k)/k$ ,
- 4) Compute  $\hat{t} = s^2_u / (\bar{x}_u - x_0)^2$ ,
- 5) Estimate Lambda ( $\lambda$ ) from Table 2-2 using  $h$  and  $\hat{t}$ ,
- 6) Estimate the mean and variance of the population from which the censored data set was drawn by computing

$$x = x_u - 2\lambda (x_u - x_o)$$

$$\text{and } s = [s_u^2 + 2\lambda (x_u - x_o)^2]^{1/2}$$

For data sets with two or more different detection limits, the average of the detection limits will be used in place of  $x_o$

#### 2 4 3 Radiochemistry Statistics

In responses to EPA comments on the December 15, 1989 draft Background Geochemical Characterization Report, it was stated that the final 1989 Background Geochemical Characterization Report would report radiochemical results that are below the minimum detectable activity (MDA) as censored data, undetected at the MDA. However, upon further review, and for the reasons discussed below, this is no longer considered an acceptable approach.

MDAs are not reported for much of the radiochemistry data collected in 1989. Also, the 1989 radiochemistry data were blank-subtracted, a common practice in radiochemistry. Current EG&G Environmental Restoration Department guidelines for radiochemical analyses now require that data not be blank-subtracted. However, at the time of writing, information is not available to un-correct these analyses. Because of the blank subtraction many of the concentrations are reported as zero, or negative numbers, and there are no non-detects for this data as discussed below.

It must be emphasized that blank subtracted radiochemistry data differ from commonly reported non-radiochemistry analytes for which the concentrations of non-detects are known to lie between zero and the detection limit. In the case of blank subtracted radiochemistry, inspection of the data indicates that the magnitude of the minimum detectable activity (MDA) is unrelated to the magnitude of the result (whether it is negative, positive, or zero). Instead the result is strongly dependent on the magnitude of the blank correction itself. For example, total tritium in 1989 surface water data has a concentration range from +980 to -6930 pCi/l, while the MDA values are only 38 pCi/l and 54 pCi/l respectively for these extreme results. The large

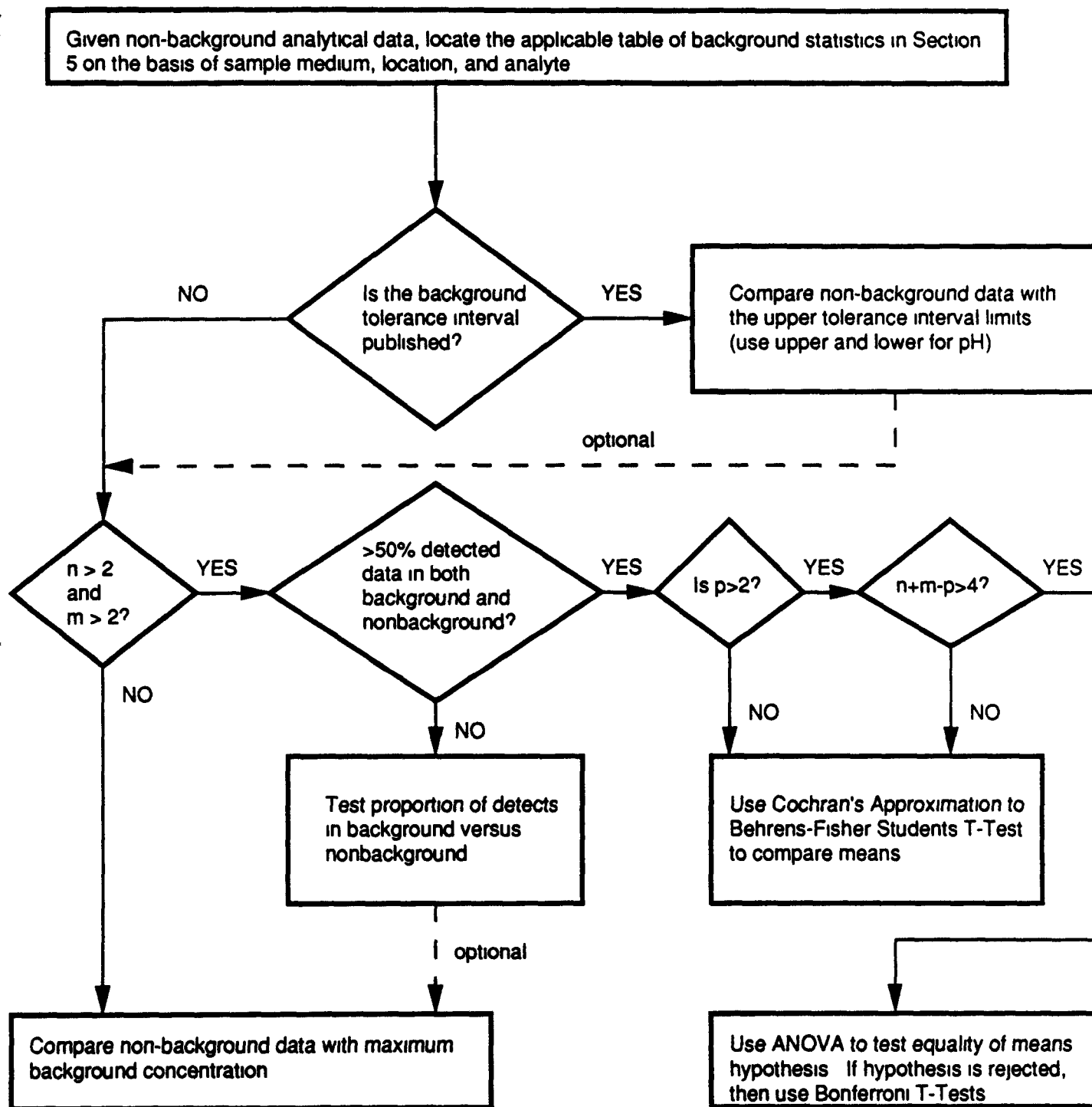
negative range is probably the result of the blank correction in combination with a large counting error. It is probably inappropriate in this case to simply replace -6930 with an MDA of only +54 pCi/l. Negative values indicate uncertainty in the data, and it is not desirable to artificially censor a data set with zero or negative values (Gilbert and Kinnison, 1981). The only restriction is that such data can not be log transformed. In the present study all of the radiochemistry data (including zero and negative values) will be used in computing statistics.

#### 2.4.4 Seasonality

If seasonal cycles are present in the water chemistry data it may be necessary to establish tolerance intervals on a seasonal basis. Combining monthly or quarterly data over the entire year will tend to mask any seasonal effects. Seasonality will be examined when sufficient data are available. The nine months of available 1989 surface water data and three quarters of ground water data are not considered sufficient to firmly establish the presence or absence of seasonal cycles in ground or surface water at Rocky Flats.

#### 2.4.5 Comparison of Background and Non-Background Data

Figure 2-2 illustrates the suggested statistical methodology for comparing non-background data with the background data and statistics presented in this report. To make such a comparison, the initial step is to locate the appropriate table of tolerance intervals and background statistics in Section 5 based on the sample medium, location, and analyte of interest. If a background tolerance limit is presented in Section 5 then each of the non-background concentrations is simply compared with the limit. It should be noted that because the tolerance limits are designed to include 95 percent coverage as suggested by EPA (1989), even background data may exceed the upper tolerance limit 5 percent of the time. Therefore, a single exceedance of an upper tolerance limit by downgradient (non-background) data is not by itself firm evidence of a chemical release to the environment.



#### EXPLANATION

$n$  = background sample size

$m$  = non-background sample size

$p$  = number of means to be compared in ANOVA

example  $p=4$  might be the background mean and 3 downgradient wells

Figure 2-2. Methods for comparing non-background with background data

It is also important to recognize that the natural geochemical evolution of ground water and surface water chemistry is not yet well understood at RFP. Background statistics reported here primarily represent upgradient or upstream data and may not accurately represent natural changes in chemical concentrations with distance along the flow path. For example, ground water parameters such as TDS are expected to increase naturally along the flow path and with residence time in the subsurface. Consequently, concentrations of TDS and naturally occurring chemicals downgradient of the plant will possibly be higher than background concentrations reported herein. Section 5 discusses changes in ground water and surface water major ion chemistry for selected analytes in the background. However, a comprehensive summary of the natural evolution of ground water and surface water geochemistry across RFP is beyond the scope of the present report.

When background tolerance limits can not be computed for an analyte because of insufficient data, Figure 2-2 suggests alternative methods for comparing downgradient and background data. If only one or two non-background data points are available, they can be compared against the maximum background concentration for the analyte using the tables in Section 5.

If there are more than a few downgradient data points and more than half of these are below the detection limit, then it may be appropriate to run a test of proportions such as Fisher's exact test (Steel and Torrie, 1980). A test of proportions compares the percent detected concentrations in the background group with the percent detected in the non-background group to look for a statistical difference.

When there are more than a few downgradient concentrations for an analyte and it has more than 50 percent detects, the mean and standard deviation may be computed (using Cohen's method if appropriate) and compared with the background mean for the analyte in Section 5. If the data come from a lognormal distribution the mean and variance should be computed using the MVU estimators described in Gilbert (1987). The comparison could be done using Cochran's approximation to the Behrens-Fisher Student's t-test (EPA, 1989). The background data required for t-testing are presented in the tables of Section 5 and include the mean, standard deviation and sample size for each analyte.

Analysis of variance (ANOVA) can be used to test the hypothesis of equality between more than two means if the applicable assumptions are met. For example, if sufficient data are available, ANOVA can be used to compare the background mean with the mean concentrations of an analyte in each of several downgradient monitoring wells. If the ANOVA rejects the null hypothesis, multiple comparison testing (Bonferroni t-tests) should be performed to identify the unequal means. Without the comparison testing it would not be clear, for example, if ANOVA rejected the null hypothesis because of a difference between two downgradient wells, or between downgradient wells and background. The actual background concentration data are required in order to use ANOVA and may be found in Appendix A.

**TABLE 2-1**

**TOLERANCE FACTORS FOR NORMAL TOLERANCE LIMITS  
FOR 95% POPULATION AT 95% CONFIDENCE**

| n        | Two-Sided | One-Sided |
|----------|-----------|-----------|
| 2        | 37.67     |           |
| 3        | 9.916     | 7.655     |
| 4        | 6.370     | 5.145     |
| 5        | 5.079     | 4.202     |
| 6        | 4.414     | 3.707     |
| 7        | 4.007     | 3.399     |
| 8        | 3.732     | 3.188     |
| 9        | 3.532     | 3.031     |
| 10       | 3.379     | 2.911     |
| 11       | 3.259     | 2.815     |
| 12       | 3.162     | 2.736     |
| 13       | 3.081     | 2.670     |
| 14       | 3.012     | 2.614     |
| 15       | 2.954     | 2.566     |
| 16       | 2.903     | 2.523     |
| 17       | 2.858     | 2.486     |
| 18       | 2.819     | 2.453     |
| 19       | 2.784     | 2.423     |
| 20       | 2.752     | 2.396     |
| 21       | 2.723     | 2.371     |
| 22       | 2.697     | 2.350     |
| 23       | 2.673     | 2.329     |
| 24       | 2.651     | 2.309     |
| 25       | 2.631     | 2.292     |
| 26       | 2.612     |           |
| 27       | 2.595     |           |
| 28       | 2.579     |           |
| 29       | 2.554     |           |
| 30       | 2.549     | 2.220     |
| 35       | 2.490     | 2.166     |
| 40       | 2.445     | 2.126     |
| 45       |           | 2.092     |
| 50       | 2.379     | 2.065     |
| 60       | 2.333     |           |
| 80       | 2.272     |           |
| 100      | 2.233     | 1.924     |
| 200      | 2.143     | 1.836     |
| 500      | 2.070     | 1.763     |
| 1000     | 2.036     | 1.727     |
| Infinity | 1.960     |           |

TABLE 2-2

Values of Lambda for Estimating the Mean and Variance of a  
Normal Distribution Using the Method of Cohen (1961)

| $\tau$ | 0.01     | 0.02     | 0.03     | 0.04     | 0.05     | 0.06     | 0.07     | 0.08     | 0.09     | 0.10     | 0.15     | 0.20     |
|--------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| 0.00   | 0 010100 | 0 020400 | 0 030902 | 0 041583 | 0 052507 | 0 063627 | 0 074953 | 0 086488 | 0 098240 | 0 110200 | 0 173423 | 0 242680 |
| 0.05   | 0 010551 | 0 021294 | 0 032225 | 0 043350 | 0 054670 | 0 066189 | 0 077909 | 0 089634 | 0 101970 | 0 114310 | 0 179350 | 0 250330 |
| 0.10   | 0 010950 | 0 022082 | 0 033398 | 0 044902 | 0 056596 | 0 068483 | 0 080568 | 0 092852 | 0 105340 | 0 118040 | 0 184790 | 0 257410 |
| 0.15   | 0 011310 | 0 022798 | 0 034466 | 0 046318 | 0 058356 | 0 070586 | 0 083009 | 0 095629 | 0 108450 | 0 121480 | 0 189650 | 0 264050 |
| 0.20   | 0 011642 | 0 023459 | 0 035453 | 0 047629 | 0 059990 | 0 072539 | 0 085280 | 0 098216 | 0 111350 | 0 124690 | 0 194600 | 0 270310 |
| 0.25   | 0 011952 | 0 024076 | 0 036377 | 0 048858 | 0 061522 | 0 074372 | 0 087413 | 0 100650 | 0 114080 | 0 127720 | 0 199100 | 0 276260 |
| 0.30   | 0 012243 | 0 024658 | 0 037249 | 0 050018 | 0 062969 | 0 076106 | 0 089433 | 0 102950 | 0 116670 | 0 130590 | 0 203380 | 0 281930 |
| 0.35   | 0 012520 | 0 025211 | 0 038077 | 0 051120 | 0 064345 | 0 077756 | 0 091355 | 0 105150 | 0 119140 | 0 133330 | 0 207470 | 0 287370 |
| 0.40   | 0 012784 | 0 025738 | 0 038866 | 0 052173 | 0 065660 | 0 079332 | 0 093193 | 0 107250 | 0 121500 | 0 135950 | 0 211390 | 0 292600 |
| 0.45   | 0 013036 | 0 026243 | 0 039624 | 0 053182 | 0 066921 | 0 080845 | 0 094958 | 0 109260 | 0 123770 | 0 138470 | 0 215170 | 0 297650 |
| 0.50   | 0 013279 | 0 026728 | 0 040352 | 0 054153 | 0 068135 | 0 082301 | 0 096657 | 0 111210 | 0 125950 | 0 140900 | 0 218820 | 0 302530 |
| 0.55   | 0 013513 | 0 027196 | 0 041054 | 0 055089 | 0 069306 | 0 083708 | 0 098298 | 0 113080 | 0 128060 | 0 143250 | 0 222350 | 0 307250 |
| 0.60   | 0 013739 | 0 027649 | 0 041733 | 0 055995 | 0 070439 | 0 085068 | 0 099887 | 0 114900 | 0 130110 | 0 145520 | 0 225780 | 0 311840 |
| 0.65   | 0 013958 | 0 028087 | 0 042391 | 0 056874 | 0 071538 | 0 086388 | 0 101430 | 0 116660 | 0 132090 | 0 147730 | 0 229100 | 0 316300 |
| 0.70   | 0 014171 | 0 028513 | 0 043030 | 0 057726 | 0 072605 | 0 087670 | 0 102920 | 0 118370 | 0 134020 | 0 149870 | 0 232340 | 0 320650 |
| 0.75   | 0 014378 | 0 028927 | 0 043652 | 0 058556 | 0 073643 | 0 088917 | 0 104380 | 0 120040 | 0 135900 | 0 151960 | 0 235500 | 0 324890 |
| 0.80   | 0 014579 | 0 029330 | 0 044258 | 0 059364 | 0 074655 | 0 090133 | 0 105800 | 0 121670 | 0 137730 | 0 154000 | 0 238580 | 0 329030 |
| 0.85   | 0 014775 | 0 029723 | 0 044848 | 0 060153 | 0 075642 | 0 091319 | 0 107190 | 0 123250 | 0 139520 | 0 155990 | 0 241580 | 0 333070 |
| 0.90   | 0 014967 | 0 030107 | 0 045425 | 0 060923 | 0 076606 | 0 092477 | 0 108540 | 0 124800 | 0 141260 | 0 157930 | 0 244520 | 0 337030 |
| 0.95   | 0 015154 | 0 030483 | 0 045989 | 0 061676 | 0 077549 | 0 093611 | 0 109870 | 0 126320 | 0 142970 | 0 159830 | 0 247400 | 0 340910 |
| 1.00   | 0 015338 | 0 030850 | 0 046540 | 0 062413 | 0 078471 | 0 094720 | 0 111160 | 0 127800 | 0 144650 | 0 161700 | 0 250220 | 0 344710 |

TABLE 2-2  
(continued)  
Values of Lambda for Estimating the Mean and Variance of a  
Normal Distribution Using the Method of Cohen (1961)

| Tau  | h | .25      | .30      | 35       | 40       | 45       | 50       | 55       | 60       | 65       | 70       | 80       | 90       |
|------|---|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| 0.00 |   | 0.318620 | 0.402100 | 0.494100 | 0.596100 | 0.709600 | 0.836800 | 0.980800 | 1.145000 | 1.336000 | 1.561000 | 2.176000 | 3.283000 |
| 0.05 |   | 0.327930 | 0.413000 | 0.506600 | 0.610100 | 0.725200 | 0.854000 | 0.999400 | 1.166000 | 1.358000 | 1.585000 | 2.203000 | 3.314000 |
| 0.10 |   | 0.336620 | 0.423300 | 0.518400 | 0.623400 | 0.740000 | 0.870300 | 1.017000 | 1.185000 | 1.379000 | 1.608000 | 2.229000 | 3.345000 |
| 0.15 |   | 0.344800 | 0.433000 | 0.529600 | 0.636100 | 0.754200 | 0.886000 | 1.035000 | 1.204000 | 1.400000 | 1.630000 | 2.255000 | 3.376000 |
| 0.20 |   | 0.352550 | 0.442200 | 0.540300 | 0.648300 | 0.767800 | 0.901200 | 1.051000 | 1.222000 | 1.419000 | 1.651000 | 2.280000 | 3.405000 |
| 0.25 |   | 0.359930 | 0.451000 | 0.550600 | 0.660000 | 0.781000 | 0.915800 | 1.067000 | 1.240000 | 1.439000 | 1.672000 | 2.305000 | 3.435000 |
| 0.30 |   | 0.367000 | 0.459500 | 0.560400 | 0.671300 | 0.793700 | 0.930000 | 1.083000 | 1.257000 | 1.457000 | 1.693000 | 2.329000 | 3.464000 |
| 0.35 |   | 0.373790 | 0.467600 | 0.569900 | 0.682100 | 0.806000 | 0.943700 | 1.098000 | 1.274000 | 1.476000 | 1.713000 | 2.353000 | 3.492000 |
| 0.40 |   | 0.380330 | 0.475500 | 0.579100 | 0.692700 | 0.816900 | 0.957000 | 1.113000 | 1.290000 | 1.494000 | 1.732000 | 2.376000 | 3.520000 |
| 0.45 |   | 0.386630 | 0.483100 | 0.588000 | 0.702900 | 0.829500 | 0.970000 | 1.127000 | 1.306000 | 1.511000 | 1.751000 | 2.399000 | 3.547000 |
| 0.50 |   | 0.392760 | 0.490400 | 0.596700 | 0.712900 | 0.840800 | 0.982600 | 1.141000 | 1.321000 | 1.528000 | 1.770000 | 2.421000 | 3.575000 |
| 0.55 |   | 0.398700 | 0.497600 | 0.605100 | 0.722500 | 0.851700 | 0.995000 | 1.155000 | 1.337000 | 1.545000 | 1.788000 | 2.443000 | 3.601000 |
| 0.60 |   | 0.404470 | 0.504500 | 0.613300 | 0.732000 | 0.862500 | 1.007000 | 1.169000 | 1.351000 | 1.561000 | 1.806000 | 2.465000 | 3.628000 |
| 0.65 |   | 0.410080 | 0.511400 | 0.621300 | 0.741200 | 0.872900 | 1.019000 | 1.182000 | 1.366000 | 1.577000 | 1.824000 | 2.486000 | 3.654000 |
| 0.70 |   | 0.415550 | 0.518000 | 0.629100 | 0.750200 | 0.883200 | 1.030000 | 1.195000 | 1.380000 | 1.593000 | 1.841000 | 2.507000 | 3.679000 |
| 0.75 |   | 0.420900 | 0.524500 | 0.636700 | 0.759000 | 0.893200 | 1.042000 | 1.207000 | 1.394000 | 1.608000 | 1.858000 | 2.528000 | 3.705000 |
| 0.80 |   | 0.426120 | 0.530800 | 0.644100 | 0.767600 | 0.903100 | 1.053000 | 1.220000 | 1.408000 | 1.624000 | 1.875000 | 2.548000 | 3.730000 |
| 0.85 |   | 0.431220 | 0.537000 | 0.651500 | 0.776100 | 0.912700 | 1.064000 | 1.232000 | 1.422000 | 1.639000 | 1.892000 | 2.568000 | 3.754000 |
| 0.90 |   | 0.436220 | 0.543000 | 0.658600 | 0.784400 | 0.922200 | 1.074000 | 1.244000 | 1.435000 | 1.653000 | 1.908000 | 2.588000 | 3.779000 |
| 0.95 |   | 0.441120 | 0.549000 | 0.665600 | 0.792500 | 0.931400 | 1.085000 | 1.255000 | 1.448000 | 1.668000 | 1.924000 | 2.607000 | 3.803000 |
| 1.00 |   | 0.445920 | 0.554800 | 0.672400 | 0.800500 | 0.940600 | 1.095000 | 1.267000 | 1.461000 | 1.682000 | 1.940000 | 2.626000 | 3.827000 |

## **SECTION 3**

### **SAMPLING LOCATIONS AND SAMPLE COLLECTION**

In order to identify possible chemical changes in surface and ground water quality, stream sediments, and borehole materials due to Plant operations, background conditions are being evaluated in these media. Fifty monitoring wells were installed during this program and nine stations were selected for collection of surface water and sediment samples (Plate 1). In addition, samples were collected from eighteen boreholes for chemical analysis. Sample sites were selected outside and upgradient of known contaminated areas so that areas with geological and hydrogeological characteristics similar to impacted areas on plantsite could be evaluated.

All ground water, surface water, borehole, and sediment sampling activities in 1989 were conducted in accordance with the ER Program Standard Operating Procedures (SOPs) for Rocky Flats Plant (Rockwell International, 1989b). Laboratory analyses of the samples were performed following Contract Laboratory Program (CLP) protocols for the inorganic Target Analyte List (TAL). Details of laboratory analyses for these and other constituents are presented in the Quality Assurance/Quality Control (QA/QC) Plan (Rockwell International, 1989c). Also presented in the QA/QC plan are the guidelines used during the Background Field Program for collection of QA/QC samples (field/equipment blanks, and field duplicates).

#### **3.1 GROUND WATER**

Two ground-water flow systems have been identified within the Rocky Flats Plant: a surficial flow system within the Rocky Flats Alluvium, colluvium, valley fill and weathered bedrock, and a bedrock flow system within unweathered bedrock sandstones (Figure 3-1). The most significant hydraulic connection between the two flow systems is the bedrock sandstone which subcrops beneath surficial materials. The ongoing geologic characterization program at the RFP is utilizing both borehole and seismic data to construct accurate representations of the subsurface geology. The program has identified several mappable sandstones,

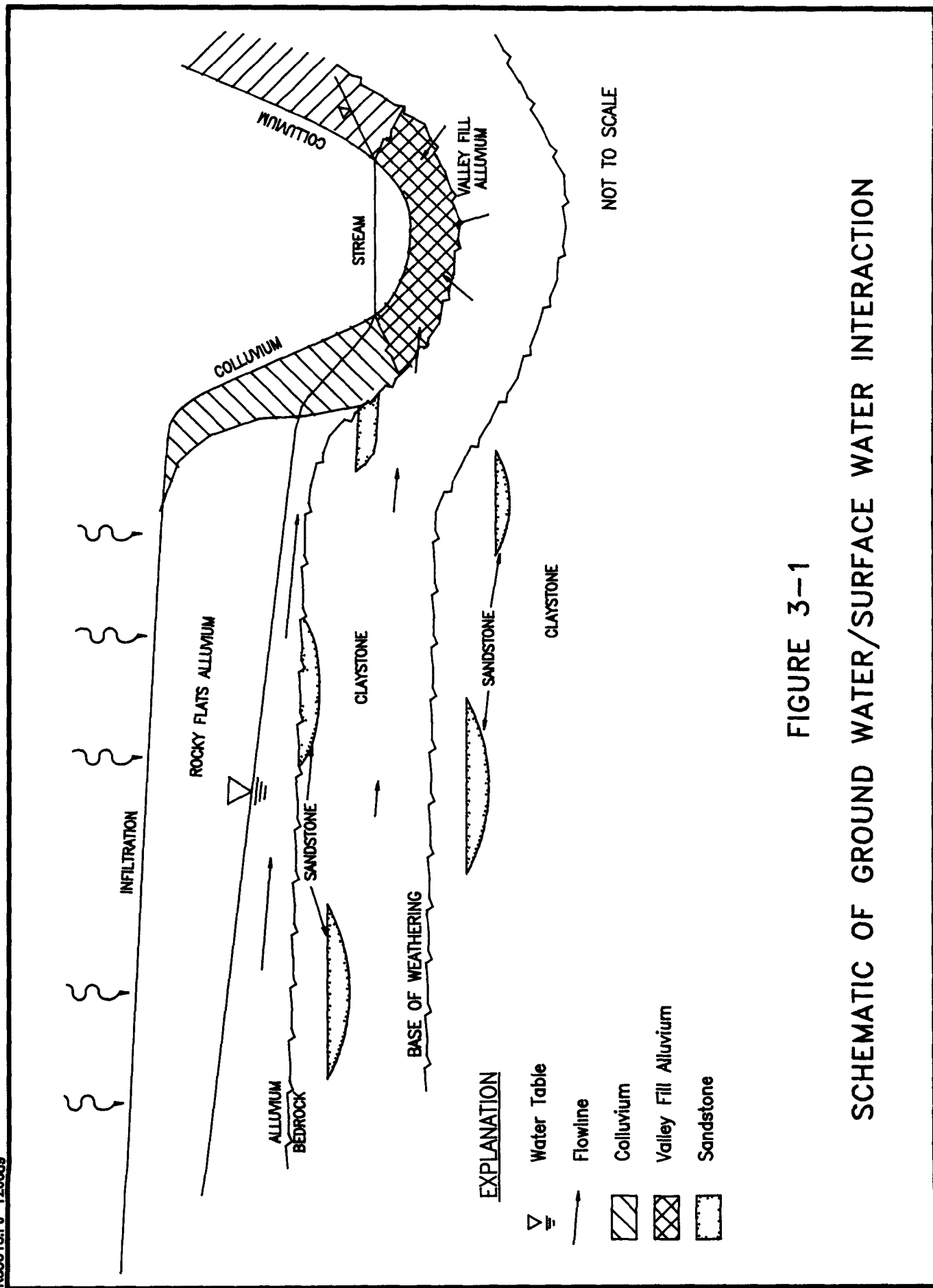


FIGURE 3-1  
SCHEMATIC OF GROUND WATER/SURFACE WATER INTERACTION

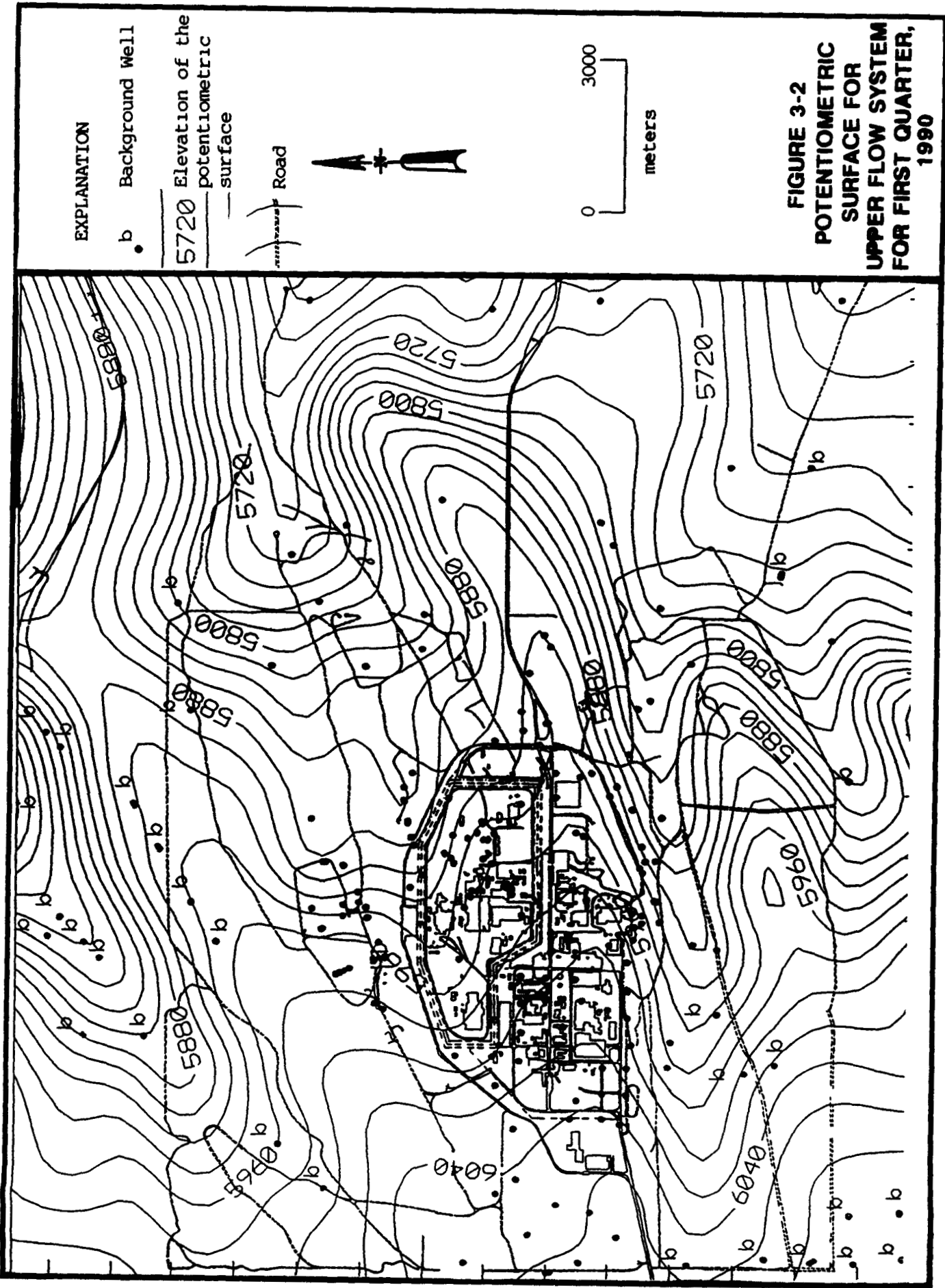
and will more thoroughly address the hydraulic connectivity between the sandstones and the overlying alluvial materials in the near future

Ground water flow for the surficial and bedrock systems is generally from west to east, although ground water flow in the surficial system is locally determined by topography. Figure 3-2 shows the potentiometric surface for the surficial ground water system at the RFP for the first quarter of 1990. Inspection of the potentiometric surface map shows that the southern and southwestern background wells are predominantly upgradient and sidegradient of the Woman Creek flow system, and that flow is from west to east. The northern background wells are mostly in the Rock Creek flow system, and the flow is southwest to northeast. The aquifer materials in the Rock Creek flow system are lithologically similar to those in the North and South Walnut Creek areas, so comparisons can be made between the northern background ground water and ground water in the Walnut Creek catchment basin.

Ground water within the Rocky Flats Alluvium moves downslope into colluvium and then into valley fill. Ground water from the Rocky Flats Alluvium probably moves vertically into weathered bedrock and unweathered bedrock through subcropping sandstones.

Samples collected from fifty-one ground-water monitoring wells (fifty wells installed in 1989 and one well installed in 1986) at the Rocky Flats Plant were analyzed to characterize background ground-water quality (Table 3-1). Also shown in Table 3-1 are the completion units for each of the background monitoring wells. (The completion unit is the geologic unit surrounding the screened interval of the well, and which yields the water.) Wells were completed in the alluvium, colluvium, valley fill alluvium, and weathered and unweathered bedrock. A brief discussion of the completion lithologies is presented in Section 3.4 (Borehole Sampling).

A new well numbering system was invoked in 1989 so that each well on plant site has a unique identifier. Plate 1 shows all of the background wells and their new numbers, and Table 3-1 shows both the new and old numbers for both wells and boreholes. The prefix associated with each well is a locator code that allows the user to find each well more easily. Plate 1 shows the RFP divided into two sets of 4 quadrants each,



P1-P4, and B1-B4, referring to the Plant and Buffer Zones, respectively. The first two characters of each well or borehole number allow the user to locate the well/borehole in one of the eight quadrants, making it easier to identify a well among the 346 wells currently on plant site.

Results of three rounds of ground water samples are presented in this report. Round 1 began on April 4, 1989, and was completed on July 17, 1989, rounds 2 and 3 correspond to the third and fourth quarters of 1989. A total of 35 samples were collected from the fifty-one wells in the first round, 41 samples were collected in the second round, and 38 samples were collected in the third round (Appendix A). The samples collected were analyzed for the parameters listed in Table 3-2. Contract Laboratory Program (CLP) Target Compound List (TCL) organics were not analyzed during 1989 but were sampled and analyzed during 1990.

Sixteen wells were dry during the Round 1 sampling effort, 10 wells were dry during round 2, and 13 wells were dry during round 3 (Appendix A). A well was considered dry if the water level in the well was below the base of the screen prior to the pre-sample purge.

### 3.1.1 Rocky Flats Alluvial Ground Water

Alluvial ground water was characterized by sampling eight wells installed in Rocky Flats Alluvium during 1989 (Wells B400189, B400289, B400389, B400489, B200589, B200689, B200789 and B200889), and one well installed in 1986 (B405586) (Plate 1). The wells were installed in two different areas of the Plant Buffer Zone to examine spatial variability within the same geological unit. Wells B405586, B400189, B400289, B400389 and B400489 were installed in the southwest portion of the Buffer Zone to characterize Rocky Flats Alluvium typical of the West Spray Field and Woman Creek drainage basin areas. Wells B200589, B200689, B200789, and B200889 were installed in the Northern Buffer Zone sidegradient of the Plant to characterize the same mappable geologic unit in closer proximity to the alluvial materials at the Solar Evaporation Ponds and Operable Unit 2 (OU2). This report examines whether statistically significant geochemical differences exist between the northern cluster of wells, and the southwestern cluster even though the wells are completed in the same geologic units.

### 3 1 2 Colluvial Ground Water

Ten wells were installed in colluvial materials in the North and South Buffer Zone to examine whether colluvium geochemistry varies significantly in different areas of the RFP. Wells B201089, B201189, B201289, B201489, B201589 and B205589 were installed in the North Buffer Zone, whereas wells B301889, B401989, B302089 and B405989 were installed in the South Buffer Zone (Plate 1). The reasoning behind the location of these wells is similar to that for locating the wells completed in Rocky Flats Alluvium. Colluvial wells in the South Buffer Zone most closely represent wells completed in colluvium in portions of Operable Unit 1 (OU1) and OU2 that impact the Woman Creek drainage basin, North Buffer Zone colluvial wells most closely represent colluvial wells at the Solar Ponds, Present Landfill, and portions of OU2 impacting the Walnut Creek catchment basin.

### 3 1 3 Valley Fill Alluvial Ground Water

Valley fill ground water quality was characterized by sampling nine wells installed in valley fill materials in the North and South Buffer Zone areas (Plate 1). Wells B102289, B102389, B202489 and B202589 were installed at four locations along the Rock Creek drainage, and five additional wells were installed in the Woman Creek drainage and other unnamed drainages in the South Buffer Zone (B402689, B302789, B302889, B302989 and B303089) to examine whether the geochemistry of the valley fill material changes across the RFP.

### 3 1 4 Bedrock Ground Water

Data for the characterization of background bedrock ground-water quality were collected by installing and sampling 21 monitoring wells completed in bedrock. These wells were drilled in various areas of the Plant Buffer Zone (Plate 1) following similar reasoning to that presented for the alluvial wells. Wells were completed in three types of bedrock materials: weathered claystone, weathered sandstone, and unweathered sandstone.

Eleven bedrock wells were completed in the Northern Buffer Zone. Five of the eleven wells (B303189, B203289, B203489, B203589 and B203689) were installed adjacent to the sidegradient northern alluvial wells.

and were completed in weathered claystone. The remaining six wells (B203789, B203889, B203989, B204089, B204189 and B204689) were completed in unweathered sandstones.

Ten bedrock wells were installed in the Southern Buffer Zone. Three were completed in unweathered sandstones (wells B304289, B304989, and B405289), five were completed in shallow, weathered claystone (wells B304789, B304889, B405189, B305389, and B405489), and two (wells B402189 and B405889) were completed in weathered sandstones.

### 3.2 SURFACE WATER

Eleven surface water monitoring locations were selected as background stations (Plate 1 and Table 3-3). Two stations (SW107 and SW042) are located in the Woman Creek drainage upstream of all sites and units. Three stations (SW041, SW080, and SW104) are positioned within tributaries entering Woman Creek from the southwest. Stations SW007 and SW008 are situated near the headwaters of a tributary of Walnut Creek and stations SW006, SW005, SW108, and SW004 are located along the Rock Creek drainage. Background locations SW008 and SW042 were not sampled in 1989, but are included in the 1990 sampling program.

Analytical data from all four quarters of 1989 is presented in this report. Stations were sampled monthly during 1989, however only one station (SW104) had sufficient water for all 10 monthly sampling rounds. The first round of samples was collected between 2/24/89 and 3/2/89 with nine stations sampled (Appendix A). Flows for the stations vary seasonally, resulting in dry stations for several of the sites during the summer and early fall months. Flow for station SW041 also varies depending on discharge and irrigation needs supplied from Rocky Flats Lake, which flows through an irrigation canal at various times during the year and enters a tributary of Woman Creek upstream of SW041. All surface water analytical data is tabulated in Appendix A.

Laboratory analyses on background surface water samples consisted of the parameters listed in Table 3-2. Surface water samples were analyzed in the field for Ph, conductivity, temperature, and dissolved oxygen (Appendix A).

### **3 3 STREAM SEDIMENT**

Background stream sediment chemistry was evaluated by sampling 10 sediment monitoring locations for subsequent chemical analyses (Plate 1 and Table 3-3) These stations are paired with the background surface water stations described above Stations SED20, SED21, SED22, and SED23 are located in the Rock Creek drainage, station SED04 is located in Walnut Creek, and stations SED15, SED16, SED17, SED18, and SED19 are located in Woman Creek These sites were selected as locations representative of sediments present in the drainages on the plant site where impacts from sites or units are not anticipated

Two rounds of sampling were completed in 1989, samples were collected between 2/21/89 and 2/24/89 for the first round and between 10/27/89 and 10/30/89 for the second round Samples were collected during each round from the same locations, and the data is tabulated for round 1 in Appendix A Round 2 data has not yet been received from the laboratories The background sediment samples were analyzed for the parameters listed in Table 3-4

### **3 4 BOREHOLE SAMPLES**

Hurr (1976) provides a geologic map and a brief discussion identifying the major surficial lithologic units in the Rocky Flats area The map shows Rocky Flats Alluvium as the predominant surficial deposit, together with lesser amounts of valley fill, and minor Slocum Alluvium and Verdos Alluvium Colluvium is not shown on the map but is discussed by Hurr as the product of mass wasting on sides and at the base of hills and slopes Rocky Flats Alluvium, valley fill, and colluvium are the predominant surficial deposits at the RFP, so samples were collected for background characterization from both the borehole material and ground water associated with these lithologies Plate 3 shows the surficial geology at the RFP in more detail than is provided by Hurr (1976) Valley fill represents mainly reworked colluvium and Rocky Flats Alluvium in the bottom of a stream channel Sediment samples collected within the active channels represent the valley fill, hence boreholes were not drilled and sampled within that unit Many of the Operable Unit sites are situated on Rocky Flats Alluvium, including the Present Landfill, Original Process Waste Lines, West Spray Field, Solar Evaporation Ponds, 903

Pad Area, Mound Area, and East Trenches Areas Colluvium also occurs in these investigation areas as well as in the 881 Hillside Area (OU1) Development of background data therefore required collecting borehole samples from both units

Bedrock underlies all of the Operable Units at the RFP, and in many instances may be hydraulically connected through subcropping sandstones and more permeable weathered claystone Hurr (1976) shows both Cretaceous Arapahoe Formation and Laramie Formations underlying the Plant site The ongoing geological characterization is currently revising the bedrock lithological interpretation, so this report does not distinguish between the Arapahoe and Laramie Formations, but classifies bedrock into descriptive units that include weathered claystone, weathered sandstone, and unweathered sandstone Sampling and analysis of the major bedrock lithologies for background characterization is important for comparison to similar units that may have been impacted by past contamination

Borehole samples were collected from nine borings drilled in the Rocky Flats Alluvium and nine boreholes drilled in colluvial materials (Plate 1) Weathered bedrock samples were also collected from the boreholes drilled in the colluvium to characterize both the weathered sandstone and claystone

Boreholes were drilled and sampled in several different areas of the Plant to address whether or not each lithologic unit is geochemically homogeneous across the plantsite Appendix A tabulates both the sample results and the depths sampled for each borehole, Table 3-5 describes each sample collected, and Section 5 discusses the geochemical results

Boreholes B400189, B400289, B400389, and B400489 were drilled in the Southwestern Buffer Zone and boreholes B200589, B200689, B200789, B200889, and B200989 were drilled in the Northern Buffer Zone (Plate 1) These boreholes were used to collect soil samples to characterize the geochemistry of the Rocky Flats Alluvium Background samples from colluvial materials were also collected in both the Northern and Southern Buffer Zones Boreholes B201189, B201289, B201489, and B201589 were drilled along the Rock Creek valley walls and borehole B201089 was drilled along McKay Ditch Boreholes B301889, B401989, B302089 and

B402189 were drilled in the Southern Buffer Zone along the south wall of Woman Creek

Split- spoon, split-tube samples, or cuttings were collected from ground surface to the total depth of each borehole. Composite samples of the borehole material were prepared from each desired interval based on drilled footages and lithology (Table 3-5). Each soil boring in the Rocky Flats Alluvium extended from ground surface to approximately three feet below the alluvium/bedrock contact. A three-foot (drilled footage) composite sample was collected at the surface of each borehole regardless of lithology. Discrete samples of borehole material require at least a two foot interval to provide sufficient volume for a complete suite of analyses. Six-foot composite samples were collected from three feet below ground surface to the alluvium/bedrock contact unless a lithologically distinct layer two feet or greater in thickness was encountered. If encountered, the lithologically distinct layer was sampled. A total of 70 samples (excluding field duplicates and redrills) collected from within the Rocky Flats Alluvium were submitted to the laboratory for chemical analysis.

Sampling methodology for boreholes drilled in colluvium was the same as for the Rocky Flats Alluvium Boreholes except that these borings extended approximately twelve feet into bedrock so that weathered bedrock samples could be obtained. A total of 28 samples of the colluvial materials were collected and submitted for chemical analysis.

The weathered bedrock samples were comprised of two six-foot composite samples originating at the colluvium/bedrock contact. As in alluvial samples, discrete samples were collected if a lithologically distinct layer two feet or greater in thickness was encountered. Twenty weathered bedrock samples were collected for chemical analysis.

Samples were submitted to the laboratory for chemical analysis. Borehole material samples were analyzed for the parameters listed in Table 3-6. With the exception of Target Compound List (TCL) organics, and hexavalent and trivalent chromium, this list includes all parameters for which investigative samples from the 881 Hillside, 903 Pad, Mound, East Trenches, Solar Evaporation Ponds, and West Spray Field have been

analyzed TCL organic compounds were not expected to be present in background soils and bedrock materials, and therefore were not selected as analytes. A separate off-site investigation is being conducted to verify the background concentration range of plutonium in surficial soils.

TABLE 3-1

Well and Borehole Data

for

Background Ground-Water Monitoring Wells and Boreholes at Rocky Flats Plant

| Previous<br>Well<br>Number | Well<br>Number | Well<br>Status | Previous<br>Borehole<br>Number | Borehole<br>Number | Borehole<br>Status | Ground<br>Surface<br>Elev (ft) | Top of<br>Casing<br>Elev (ft) | Depth to<br>Top of<br>Screen (ft) | Depth to<br>Bottom of<br>Screen (ft) | Total<br>Depth (ft) | Depth to Borehole<br>Bedrock Total<br>(ft) | Bedrock<br>Elevation<br>(ft) | Geologic<br>Strata of<br>Complete | Northing<br>Coordinate<br>(ft) - NFP | Easting<br>Coordinate<br>(ft) - NFP | State       | State<br>Eastings<br>(ft) |
|----------------------------|----------------|----------------|--------------------------------|--------------------|--------------------|--------------------------------|-------------------------------|-----------------------------------|--------------------------------------|---------------------|--|------------------------------|-----------------------------------|--------------------------------------|-------------------------------------|-------------|---------------------------|
| 5586                       | B405586        | 1              |                                |                    |                    | 6103 62                        | 6105 81                       | 3 55                              | 36 39                                | 36 39               | 35 50                                      | 6068 12                      | Qr-f                              | 32259 45                             | 15217 16                            | 745260 8365 | 2078321 1160              |
| 0189A                      | B400189        | 1              |                                |                    |                    | 6122 10                        | 6124 15                       | 10 09                             | 49 60                                | 51 35               | 49 80                                      | 6072 30                      | Qr-f                              | 31600 11                             | 15183 13                            | 744565 1830 | 2078308 5787              |
| 0289                       | B400289        | 1.5            | BH0289                         | B400289            | 1.5                | 6105 90                        | 6107 71                       | 20 52                             | 50 00                                | 51 25               | 49 60                                      | 6056 30                      | Qr-f                              | 31676 84                             | 16017 21                            | 744644 6478 | 2079142 1870              |
| 0389                       | B400389        | 1              | BH0389                         | B400389            | 1                  | 6122 00                        | 6124 00                       | 9 50                              | 49 00                                | 50 30               | 48 50                                      | 6073 50                      | Qr-f                              | 30794 80                             | 15266 77                            | 743760 3577 | 2078394 8564              |
| 0489                       | B400489        | 1              | BH0489                         | B400489            | 1.5                | 6105 90                        | 6107 07                       | 9 87                              | 54 45                                | 55 70               | 54 00                                      | 6051 90                      | Qr-f                              | 30852 38                             | 16077 58                            | 743820 5973 | 2079205 2666              |
| 0589                       | B200589        | 1              | BH0589                         | B200589            | 1                  | 5968 40                        | 5970 17                       | 11 86                             | 31 57                                | 33 31               | 30 00                                      | 5938 40                      | Qr-f                              | 41857 55                             | 20445 99                            | 754837 3135 | 2083536 2087              |
| 0689                       | B200689        | 1              | BH0689                         | B200689            | 1                  | 5960 10                        | 5961 94                       | 11 58                             | 31 05                                | 32 80               | 30 60                                      | 5929 50                      | Qr-f                              | 42256 66                             | 21069 70                            | 755238 3808 | 2084158 4352              |
| 0789                       | B200789        | 1              | BH0789                         | B200789            | 1.5                | 5946 10                        | 5948 08                       | 9 07                              | 28 50                                | 30 47               | 28 00                                      | 5918 10                      | Qr-f                              | 42781 02                             | 21921 46                            | 755765 4125 | 2085008 2449              |
| 0889                       | B200889        | 1              | BH0889                         | B200889            | 1.5                | 5936 10                        | 5938 08                       | 8 60                              | 23 12                                | 24 70               | 22 80                                      | 5913 30                      | Qr-f                              | 43199 87                             | 22617 22                            | 756186 4527 | 2085702 4430              |
|                            |                |                |                                |                    | 2                  | 5920 80                        |                               |                                   |                                      |                     | 22 00                                      | 5898 80                      |                                   | 43725 60                             | 23447 44                            | 756714 7896 | 2086530 7080              |
| 0989                       | B201089        | 1              | BH1089                         | B201089            | 1                  | 5883 10                        | 5885 15                       | 3 48                              | 7 83                                 | 9 60                | 7 50                                       | 5875 60                      | Qc                                | 42275 09                             | 24169 13                            | 755267 0405 | 2087256 9935              |
| 1089                       | B201189        | 1              | BH1189                         | B201189            | 1                  | 5806 50                        | 5808 41                       | 20 36                             | 34 80                                | 36 50               | 34 00                                      | 5772 50                      | Qc                                | 44655 14                             | 23771 64                            | 757645 1486 | 2086851 7585              |
| 1189                       | B201289        | 1              | BH1289                         | B201289            | 1                  | 5826 10                        | 5827 80                       | 14 73                             | 23 90                                | 26 11               | 23 40                                      | 5802 70                      | Qc                                | 44616 73                             | 20500 44                            | 757595 9555 | 2083581 5337              |
| 1289                       | B201489        | 1              | BH1389                         | B201489            | 1                  | 5859 40                        | 5861 20                       | 5 58                              | 9 96                                 | 11 64               | 7 00                                       | 5852 40                      | Qc                                | 44092 75                             | 22254 49                            | 757077 9028 | 2085336 8530              |
| 1389                       | B201589        | 1.5            | BH1489                         | B201589            | 1                  | 5846 00                        | 5847 68                       | 4 38                              | 8 76                                 | 10 50               | 8 20                                       | 5837 80                      | Qc                                | 44426 56                             | 23548 26                            | 757815 8909 | 2086629 1867              |
| 1489                       | B301889        | 1.5            | BH1589                         | B301889            | 1                  | 5866 80                        | 5868 83                       | 13 16                             | 22 60                                | 24 45               | 22 30                                      | 5844 50                      | Qc                                | 34321 96                             | 22207 35                            | 747309 5078 | 2085321 9781              |
| 1589                       | B401989        | 1.5            | BH1689                         | B401989            | 1                  | 6025 60                        | 6027 67                       | 6 55                              | 21 00                                | 22 65               | 20 50                                      | 6005 10                      | Qc                                | 32873 07                             | 18514 33                            | 745848 8073 | 2081634 7119              |
| 1689                       | B302089        | 1              | BH1789                         | B302089            | 1                  | 5907 50                        | 5909 55                       | 3 85                              | 13 30                                | 15 00               | 13 50                                      | 5894 00                      | Qc                                | 33804 66                             | 20373 64                            | 746786 2956 | 2083490 4539              |
| 1789R                      | B402189        | 1              | BH1889                         | B402189            | 1                  | 6024 60                        | 6026 49                       | 13 50                             | 22 90                                | 24 60               | 7 50                                       | 6017 10                      | Kss(w)                            | 33364 04                             | 18357 65                            | 746339 1279 | 2081476 4480              |
| 1889                       | B102289        | 1              |                                |                    |                    | 5978 30                        | 5980 06                       | 3 00                              | 12 47                                | 14 22               | 12 50                                      | 5965 80                      | Qr-f                              | 40124 54                             | 16414 83                            | 753091 4539 | 2079511 8166              |
| 1989                       | B102389        | 1              |                                |                    |                    | 5939 50                        | 5941 18                       | 3 74                              | 10 90                                | 12 61               | 10 40                                      | 5929 10                      | Qr-f                              | 40864 32                             | 17161 65                            | 753833 5008 | 2080256 0041              |
| 2089                       | B202489        | 1              |                                |                    |                    | 5770 90                        | 5772 83                       | 3 43                              | 12 90                                | 14 65               | 12 40                                      | 5758 50                      | Qr-f                              | 44414 51                             | 20812 14                            | 757394 8212 | 2083893 8232              |
| 2189                       | B202589        | 1              |                                |                    |                    | 5723 60                        | 5725 45                       | 4 53                              | 11 60                                | 13 40               | 11 20                                      | 5712 40                      | Qr-f                              | 45126 22                             | 22633 57                            | 758112 3563 | 2085712 4261              |
| 2289                       | B402689        | 1              |                                |                    |                    | 6045 40                        | 6047 07                       | 2 55                              | 3 28                                 | 5 85                | 2 80                                       | 6042 60                      | Qr-f                              | 34264 35                             | 15145 84                            | 747228 6049 | 2078262 3035              |
| 2389                       | B302789        | 1              |                                |                    |                    | 5832 30                        | 5834 17                       | 4 00                              | 8 55                                 | 10 17               | 8 00                                       | 5824 30                      | Qr-f                              | 31715 79                             | 23104 08                            | 744706 9744 | 2086227 0822              |
| 2489                       | B302889        | 1              |                                |                    |                    | 5730 80                        | 5733 16                       | 5 92                              | 10 52                                | 12 10               | 10 20                                      | 5720 60                      | Qr-f                              | 32824 94                             | 26406 34                            | 745826 7435 | 2089524 8098              |

KEY TO STATUS 1 - Active Well 2 - Abandoned Borehole 3 - Well Removed/Replaced 4 - Inactive Well 5 - Borehole Sampled 6 - Observation Well 7 - Surface Casing Installed Not Cored

KEY TO GEOLOGIC STRATA Qr-f-Rocky Flats Alluvium Qc-Colluvium Qr-f-Valley Fill Alluvium Qt Terrace Alluvium Kcl Bedrock Weathered Claystone

Kss(u)-Bedrock Unweathered Sandstone Kss(w) Bedrock Weathered Sandstone Kst(w) Bedrock Weathered Siltstone AL undifferentiated Alluvium

TABLE 3-1 (Continued)

Well and Borehole Data

for

Background Ground-Water Monitoring Wells and Boreholes at Rocky Flats Plant

| Previous Well Number | Well Number | Well Status | Previous Borehole Number | Borehole Number | Status | Ground Elev (ft) | Top of Casing Elev (ft) | Depth to Top of Screen (ft) | Depth to Bottom of Screen (ft) | Total Depth (ft) | Bedrock Total Depth (ft) | Bedrock Elevation Complete | Geologic Strata of Complete | Northing Coordinate (ft) - RFP | Easting Coordinate (ft) - RFP | State Northing | State Easting |
|----------------------|-------------|-------------|--------------------------|-----------------|--------|------------------|-------------------------|-----------------------------|--------------------------------|------------------|--------------------------|----------------------------|-----------------------------|--------------------------------|-------------------------------|----------------|---------------|
| 2589                 | 8302989 1   |             |                          |                 |        | 5686 20          | 5688 15                 | 3 46                        | 7 90                           | 9 65             | 7 40                     | 5678 80                    | Qvf                         | 32347 94                       | 28146 31                      | 745355 6090    | 2091265 9007  |
| 2689                 | 8303089 1   |             |                          |                 |        | 5601 20          | 5602 93                 | 4 61                        | 7 00                           | 8 90             | 6 60                     | 5594 60                    | Qvf                         | 29260 92                       | 30864 52                      | 742278 3686    | 2093993 5910  |
| 27898R               | 8203189 1   |             |                          |                 |        | 5968 00          | 5970 12                 | 35 26                       | 44 70                          | 46 47            | 30 30                    | 5937 70                    | Kc1                         | 41868 42                       | 20466 34                      | 754848 2491    | 2083556 5118  |
| 28898R               | 8203289 1   |             |                          |                 |        | 5959 70          | 5961 59                 | 35 00                       | 44 47                          | 46 00            | 30 10                    | 5929 60                    | Kc1                         | 42258 71                       | 21087 88                      | 755240 4851    | 2084176 6034  |
| 29898R               | 8203489 1   |             |                          |                 |        | 5945 70          | 5947 71                 | 31 00                       | 40 50                          | 41 25            | 28 60                    | 5917 10                    | Kc1                         | 42806 76                       | 21964 89                      | 755791 2887    | 2085051 5736  |
| 30898R               | 8203589 1   |             |                          |                 |        | 5935 20          | 5937 07                 | 29 70                       | 39 16                          | 40 94            | 24 30                    | 5910 90                    | Kc1                         | 43221 96                       | 22658 39                      | 756208 6745    | 2085743 5243  |
| 31898R               | 8203689 4   |             |                          |                 |        | 5920 50          | 5922 45                 | 27 05                       | 36 55                          | 37 30            | 22 60                    | 5897 90                    | Kc1                         | 43755 65                       | 23487 29                      | 756744 9537    | 2086570 4441  |
| 32898R               | 8203789 1   |             |                          |                 |        | 5946 20          | 5948 28                 | 134 15                      | 138 59                         | 140 84           | 26 70                    | 5919 50                    | Kss(u)                      | 42792 37                       | 21944 19                      | 755776 8324    | 2085030 9263  |
| 33898R               | 8203889 1   |             |                          |                 |        | 5935 80          | 5937 69                 | 107 00                      | 111 43                         | 113 90           | 28 40                    | 5907 40                    | Kss(u)                      | 43211 47                       | 22635 78                      | 756198 1067    | 2085720 9611  |
| 34898R               | 8203989 1   |             |                          |                 |        | 5920 90          | 5922 78                 | 125 97                      | 130 42                         | 132 70           | 23 70                    | 5897 20                    | Kss(u)                      | 43740 80                       | 23469 07                      | 756730 0555    | 2086552 2860  |
| 35898R               | 8204089 1   |             |                          |                 |        | 5877 60          | 5879 29                 | 106 50                      | 112 90                         | 115 23           | 1 60                     | 5876 00                    | Kss(u)                      | 41904 59                       | 24227 96                      | 754896 8288    | 2087317 0381  |
| 36898R               | 8204189 1   |             |                          |                 |        | 5826 90          | 5828 86                 | 81 10                       | 95 33                          | 97 62            | 3 70                     | 5823 20                    | Kss(u)                      | 42344 56                       | 25382 07                      | 755340 4906    | 2088469 3930  |
| 37898R               | 8304289 1   |             |                          |                 |        | 5833 00          | 5835 18                 | 84 04                       | 88 49                          | 90 95            | 10 50                    | 5822 50                    | Kss(u)                      | 31688 14                       | 23092 28                      | 744679 3015    | 2086215 3718  |
| 38898R               | 8204689 4   |             |                          |                 |        | 5901 40          | 5902 82                 | 105 50                      | 109 95                         | 112 22           | 2 90                     | 5898 50                    | Kss(u)                      | 41797 90                       | 23567 28                      | 754787 9884    | 2086656 8840  |
| 39898R               | 8304789 1   |             |                          |                 |        | 5867 50          | 5869 56                 | 27 90                       | 37 57                          | 39 14            | 22 90                    | 5844 60                    | Kc1                         | 34321 35                       | 22184 13                      | 747308 8221    | 2085298 7662  |
| 40898R               | 8304889 1   |             |                          |                 |        | 5730 60          | 5732 56                 | 14 66                       | 24 14                          | 25 90            | 9 70                     | 5720 90                    | Kc1                         | 32815 29                       | 26451 93                      | 745817 2440    | 2089570 4247  |
| 41898R               | 8304989 1   |             |                          |                 |        | 5729 70          | 5731 85                 | 75 50                       | 82 87                          | 86 25            | 8 40                     | 5721 30                    | Kss(u)                      | 32799 24                       | 26481 33                      | 745801 2931    | 2089599 8741  |
| 42898R               | 8405189 1   |             |                          |                 |        | 5967 90          | 5969 91                 | 13 20                       | 22 69                          | 24 45            | 8 20                     | 5959 70                    | Kc1                         | 33804 20                       | 19330 97                      | 746782 3900    | 2082448 0614  |
| 43898R               | 8405289 1   |             |                          |                 |        | 5965 60          | 5967 31                 | 41 24                       | 45 67                          | 48 00            | 10 30                    | 5955 30                    | Kss(u)                      | 33819 62                       | 19347 76                      | 746797 8628    | 2082464 7930  |
| 44898R               | 8305389 1   |             |                          |                 |        | 5832 00          | 5833 90                 | 15 18                       | 24 58                          | 26 30            | 10 00                    | 5822 00                    | Kc1                         | 31726 76                       | 23109 08                      | 744717 9612    | 2086232 0415  |
| 45898R               | 8405489 1   |             |                          |                 |        | 6115 80          | 6117 67                 | 39 13                       | 48 57                          | 50 05            | 34 00                    | 6081 80                    | Kc1                         | 32239 76                       | 15235 37                      | 745204 8392    | 2078358 6905  |
| 4689                 | 8205589 1   |             |                          |                 |        | 5806 40          | 5808 46                 | 6 87                        | 16 30                          | 18 00            | 32 30                    | 5774 10                    | Qc                          | 44664 12                       | 23775 15                      | 757654 1441    | 2086855 2290  |
| 4789                 | 8405689 1   |             |                          |                 |        | 6105 20          | 6107 25                 | 3 00                        | 22 51                          | 23 75            | 0 00                     | 0 00                       | Qvf                         | 30851 28                       | 16062 22                      | 743819 4561    | 2079189 9129  |
| 4889                 | 8405789 1   |             |                          |                 |        | 6104 80          | 6106 70                 | 43 01                       | 52 48                          | 53 72            | 52 00                    | 6052 80                    | Qvf                         | 30853 20                       | 16092 40                      | 743821 4683    | 2079220 0762  |
| 49898R               | 8405889 1   |             |                          |                 |        | 6024 90          | 6026 87                 | 36 04                       | 45 50                          | 46 75            | 6 50                     | 6018 40                    | Kss (w)                     | 33357 04                       | 18357 49                      | 746332 1311    | 2081476 3079  |
| 5089                 | 8405989 1   |             |                          |                 |        | 6023 50          | 6026 06                 | 2 80                        | 6 70                           | 8 50             | 6 20                     | 6017 30                    | Qc                          | 33374 00                       | 18357 88                      | 746349 0917    | 2081476 6474  |

KEY TO STATUS 1 - Active Well 2 - Abandoned Borehole 3 - Well Removed/Replaced, 4 - Inactive Well 5 - Borehole Sampled 6 - Observation Well 7 - Surface Casing Installed Not Cored

KEY TO GEOLOGIC STRATA Qvf-Artificial Fill, Qvf-Rocky Flats Alluvium Qc-Colluvium Qvf-Valley Fill Alluvium Qt - Terrace Alluvium Kc1 Bedrock Weathered Claystone

Kss(u)-Bedrock Unweathered Sandstone Kss(w)-Bedrock Weathered Sandstone Kst(w) - Bedrock Weathered Siltstone AL undifferentiated Alluvium

**TABLE 3-2**

**ANALYTE LIST FOR BACKGROUND SURFACE AND GROUND WATER SAMPLES**

**FIELD PARAMETERS**

pH  
Specific Conductance  
Temperature  
Dissolved Oxygen\*

**INDICATORS**

Total Dissolved Solids  
Total Suspended Solids\*  
pH

**METALS\*\***

**CLP Inorganic Target Analyte List**

Aluminum  
Antimony  
Arsenic  
Barium  
Beryllium  
Cadmium  
Calcium  
Chromium  
Cobalt  
Copper  
Iron  
Lead  
Magnesium  
Manganese  
Mercury  
Nickel  
Potassium  
Selenium  
Silver  
Sodium  
Thallium  
Vanadium  
Zinc

**Other Metals**

Cesium  
Lithium  
Molybdenum  
Strontium  
Tin

**TABLE 3-2 (CONTINUED)**

**ANALYTE LIST FOR BACKGROUND SURFACE AND GROUND WATER SAMPLES**

**ANIONS**

Carbonate  
Bicarbonate  
Chloride  
Sulfate  
Nitrate (as N)  
Cyanide

**RADIONUCLIDES**

Gross Alpha  
Gross Beta  
Uranium 233, 234, 235, 238  
Americium 241  
Plutonium 239, 240  
Strontium 89, 90  
Cesium 137  
Tritium  
Radium 226, 228\*\*\*

- For surface water samples only
- \*\* Analysis for total and dissolved metals for surface water Analysis for total (Rounds 1 and 2) and dissolved (Round 1 only) radionuclides (except tritium) on surface water Analysis for dissolved metals and radionuclides (except tritium) only for ground water Analysis for total tritium only in surface water and ground water
- \*\*\* Decision tree If the Gross Alpha value was  $\geq 5$  PCi/l then the sample was analyzed for Ra 226,228

**TABLE 3-3**  
**BACKGROUND SURFACE WATER AND SEDIMENT STATION DESCRIPTIONS**  
**FOR**  
**ROCKY FLATS PLANT**

| <u>Surface Water<br/>Station Number</u> | <u>Sediment<br/>Station Number</u> | <u>Location</u>                       |
|---|------------------------------------|---------------------------------------|
| SW004                                   | SED22                              | Rock Creek Drainage                   |
| SW005                                   | SED20                              | Rock Creek Drainage                   |
| SW006                                   | SED23                              | Rock Creek Drainage                   |
| SW007                                   | SED04                              | Tributary of Walnut Creek             |
| SW008                                   | --                                 | Tributary of Walnut Creek             |
| SW041                                   | SED17                              | Tributary of Woman Creek              |
| SW042                                   | SED15                              | Woman Creek Drainage                  |
| SW080                                   | SED18                              | Tributary of Woman Creek (seep)       |
| SW104                                   | SED19                              | Tributary of Woman Creek (seep)       |
| SW107                                   | SED16                              | Woman Creek Drainage                  |
| SW108                                   | SED21                              | Rock Creek Valley Wall<br>(near seep) |

**TABLE 3-4**

**ANALYTE LIST FOR BACKGROUND SEDIMENT SAMPLES**

**METALS**

**CLP Inorganic Target Analyte List**

Aluminum  
Antimony  
Arsenic  
Barium  
Beryllium  
Cadmium  
Calcium  
Chromium  
Cobalt  
Copper  
Iron  
Lead  
Magnesium  
Manganese  
Mercury  
Nickel  
Potassium  
Selenium  
Silver  
Sodium  
Thallium  
Vanadium  
Zinc

**Other Metals**

Cesium  
Lithium  
Molybdenum  
Strontium  
Tin

**INORGANICS**

Nitrate (as N)  
pH  
percent solids

**RADIONUCLIDES**

Gross Alpha  
Gross Beta  
Uranium 233, 234, 235, 238  
Plutonium 239, 240  
Americium 241  
Strontium 89, 90  
Cesium 137  
Tritium  
Radium 226, 228

TABLE 3-5  
(Continued)  
BACKGROUND BOREHOLE SAMPLE INFORMATION

| <u>Sample Information</u> |                      |                    |                              |                                 |
|---------------------------|----------------------|--------------------|------------------------------|---------------------------------|
| <u>Borehole Number</u>    | <u>Sample Number</u> | <u>Sample Date</u> | <u>Depth Increment (ft.)</u> | <u>Lithological Description</u> |
| B405189                   | BH01890003           | 03/09/89           | 0 00 - 3 00                  | CLAYEY GRAVEL                   |
| B405189                   | BH01890309           | 03/09/89           | 3 60 - 8 55                  | SANDY GRAVEL                    |
| B405189                   | BH01890915           | 03/09/89           | 9 60 - 15 40                 | GRAVELLY CLAYEY SAND            |
| B405189                   | BH01891521           | 03/09/89           | 15 60 - 20 30                | SANDY GRAVELLY CLAY             |
| B405189                   | BH01892127           | 03/09/89           | 21 60 - 26 50                | GRAVEL                          |
| B405189                   | BH01893036           | 03/10/89           | 29 50 - 35 60                | CLAYEY GRAVEL                   |
| B405189                   | BH01893638           | 03/10/89           | 35.60 - 37.60                | GRAVELLY CLAY                   |
| B405189                   | BH01893844           | 03/10/89           | 37 60 - 42 60                | GRAVELLY CLAYEY SAND            |
| B405189                   | BH01894448           | 03/10/89           | 43 60 - 47 50                | GRAVELLY CLAYEY SAND            |
|                           |                      |                    |                              |                                 |
| B400289                   | BH02890003           | 04/12/89           | 0 00 - 3 00                  | SILTY CLAYEY SAND & GRAVEL      |
| B400289                   | BH02890309           | 04/12/89           | 4 00 - 9 00                  | SILTY CLAYEY SAND & GRAVEL      |
| B400289                   | BH02890915           | 04/12/89           | 9 00 - 14 90                 | SILTY CLAYEY SAND & GRAVEL      |
| B400289                   | BH02891521           | 04/13/89           | 16 00 - 21 10                | SILTY CLAYEY SAND & GRAVEL      |
| B400289                   | BH02891521D          | 04/13/89           | 16.00 - 21 10                | SILTY CLAYEY SAND & GRAVEL      |
| B400289                   | BH02892130           | 04/13/89           | 21 10 - 28.70                | SILTY CLAYEY SAND & GRAVEL      |
| B400289                   | BH02893036           | 04/14/89           | 30 00 - 36.00                | SILTY CLAYEY SAND & GRAVEL      |
| B400289                   | BH02893642           | 04/14/89           | 36 00 - 41 30                | SILTY CLAYEY SAND & GRAVEL      |
| B400289                   | BH02894248           | 04/17/89           | 42 00 - 47 20                | SILTY CLAYEY SAND & GRAVEL      |
|                           |                      |                    |                              |                                 |
| B400389                   | BH03890003           | 04/25/90           | 0 00 - 3 00                  | SILTY SAND                      |
| B400389                   | BH03890309           | 04/25/90           | 3 00 - 9 00                  | SILTY SAND TO CLAYEY SAND       |
| B400389                   | BH03890309D          | 04/25/89           | 3.00 - 9.00                  | SILTY SAND TO CLAYEY SAND       |
| B400389                   | BH03890915           | 04/25/89           | 9 00 - 15 00                 | SILTY SAND                      |
| B400389                   | BH03891521           | 04/25/89           | 15 00 - 21 00                | SILTY SAND                      |
| B400389                   | BH03892127           | 04/25/89           | 21 00 - 27.00                | SILTY SAND                      |
| B400389                   | BH03892733           | 04/05/89           | 27 00 - 33 00                | SILTY SAND                      |
| B400389                   | BH03893339           | 04/25/89           | 33.00 - 39.00                | SILTY SAND                      |
| B400389                   | BH03893945           | 04/26/89           | 39 00 - 45 00                | SILTY-CLAYEY SAND               |
| B400389                   | BH03894548           | 04/26/89           | 45.00 - 48.50                | SILTY-CLAYEY SAND               |
|                           |                      |                    |                              |                                 |
| B400489                   | BH04890003           | 04/28/89           | 0.00 - 3.00                  | SILTY SAND                      |
| B400489                   | BH04890309           | 04/28/89           | 3.00 - 9.00                  | SILTY SAND                      |
| B400489                   | BH04890915           | 04/28/89           | 9 00 - 15 00                 | SAND & GRAVEL                   |
| B400489                   | BH04890915D          | 04/28/89           | 9.00 - 15 00                 | SAND & GRAVEL                   |
| B400489                   | BH04891521           | 04/28/89           | 15.00 - 21 00                | SAND & GRAVEL                   |
| B400490                   | BH04892127           | 04/28/89           | 21.00 - 27.00                | SAND & GRAVEL TO SILTY SAND     |
| B400489                   | BH04892733           | 05/01/89           | 27 00 - 33.00                | SILTY SAND                      |
| B400489                   | BH04893335           | 05/01/89           | 33 00 - 35 50                | SILTY SAND                      |
| B400489                   | BH04893538           | 05/01/89           | 35.50 - 38.00                | CLAYEY SILT                     |
| B400489                   | BH04893840           | 05/01/89           | 38 00 - 40.00                | CLAYEY SILT AND SAND            |
| B400489                   | BH04894046           | 05/01/89           | 40.00 - 46.00                | SANDY GRAVEL                    |
| B400489                   | BH04894652           | 05/01/89           | 46.00 - 52.00                | SANDY GRAVEL                    |
| B400489                   | BH04895254           | 05/01/89           | 52 00 - 54.00                | SANDY GRAVEL                    |

TABLE 3-5  
(Continued)  
BACKGROUND BOREHOLE SAMPLE INFORMATION

| <u>Sample Information</u>  |                          |                        |                                  |                                     |
|----------------------------|--------------------------|------------------------|----------------------------------|-------------------------------------|
| <u>Borehole<br/>Number</u> | <u>Sample<br/>Number</u> | <u>Sample<br/>Date</u> | <u>Depth<br/>Increment (ft.)</u> | <u>Lithological<br/>Description</u> |
| 8200589                    | BH05890003R              | 03/08/89               | 0 00 - 2 80                      | SILTY SANDY CLAY                    |
| 8200589                    | BH05890003               | 02/22/89               | 0 00 - 3 10                      | GRAVEL                              |
| 8200589                    | BH05890308               | 02/22/89               | 3 50 - 8 40                      | CLAY & SAND                         |
| 8200589                    | BH05890308D              | 02/22/89               | 3.50 - 8 40                      | CLAY & SAND                         |
| 8200589                    | BH05890913               | 02/22/89               | 9 50 - 12 70                     | CLAYEY SAND                         |
| 8200589                    | BH05891317               | 02/22/89               | 13 50 - 17 00                    | SANDY CLAY                          |
| 8200589                    | BH05891723               | 02/22/89               | 17 00 - 23.50                    | GRAVEL & SAND                       |
| 8200589                    | BH05892325               | 02/22/89               | 23 50 - 25 50                    | GRAVEL & SAND                       |
| 8200589                    | BH05892530               | 02/23/89               | 25.00 - 30 00                    | GRAVEL & SAND                       |
|                            |                          |                        |                                  |                                     |
| 8200689                    | BH06890003               | 03/09/89               | 0 00 - 1 90                      | SILT & CLAY                         |
| 8200689                    | BH06890104               | 02/28/89               | 1 00 - 4.50                      | GRAVELLY CLAY                       |
| 8200689                    | BH06890410               | 02/28/89               | 4 50 - 9 20                      | GRAVEL                              |
| 8200689                    | BH06891016               | 02/28/89               | 9 90 - 15.90                     | SANDY GRAVEL                        |
| 8200689                    | BH06891618               | 02/28/89               | 15 90 - 17 90                    | CLAY                                |
| 8200689                    | BH06891824               | 02/28/89               | 17 90 - 23 90                    | SANDY CLAYEY GRAVEL                 |
| 8200689                    | BH06892430               | 02/28/89               | 23 90 - 29 40                    | SAND & GRAVEL                       |
|                            |                          |                        |                                  |                                     |
| 8200789                    | BH07890003               | 03/08/89               | 0 00 - 2 90                      | SILTY SANDY CLAY                    |
| 8200789                    | BH07890103               | 03/01/89               | 1.00 - 2.70                      | GRAVELLY CLAY                       |
| 8200789                    | BH07890306               | 03/01/89               | 3 00 - 6.30                      | CALICHE                             |
| 8200789                    | BH07890612               | 03/01/89               | 6.30 - 10 30                     | SAND & GRAVEL                       |
| 8200789                    | BH07891218               | 03/01/89               | 12.00 - 17 70                    | GRAVELLY SAND CLAY                  |
| 8200789                    | BH07891824               | 03/01/89               | 18 00 - 23 00                    | GRAVEL & SAND                       |
| 8200789                    | BH07892426               | 03/01/89               | 24 00 - 26.00                    | GRAVEL & SAND                       |
|                            |                          |                        |                                  |                                     |
| 8200889                    | BH08890003               | 03/08/89               | 0.00 - 2.10                      | GRAVELLY CLAY                       |
| 8200889                    | BH08890106               | 03/06/89               | 1 00 - 6.10                      | SANDY SILT CLAY                     |
| 8200889                    | BH08890106D              | 03/06/89               | 1 00 - 6.10                      | SANDY SILTY CLAY                    |
| 8200889                    | BH08890608               | 03/06/89               | 6 30 - 7 10                      | SILTY SAND & GRAVEL                 |
| 8200889                    | BH08890814               | 03/06/89               | 8.30 - 13 70                     | SILTY SAND                          |
| 8200889                    | BH08891420               | 03/06/89               | 14 30 - 19.30                    | SILTY SAND & GRAVEL                 |
| 8200889                    | BH08892022               | 03/06/89               | 20.30 - 21.20                    | SILTY SAND & GRAVEL                 |
| 8200989                    | BH09890003               | 03/08/89               | 0.00 - 2.80                      | GRAVEL                              |
| 8200989                    | BH09890104               | 03/02/89               | 1.00 - 4.00                      | GRAVELLY CLAY                       |
| 8200989                    | BH09890410D              | 03/02/89               | 4 00 - 9.90                      | GRAVEL & SAND                       |
| 8200989                    | BH09890410               | 03/02/89               | 4 00 - 9.90                      | GRAVEL & SAND                       |
| 8200989                    | BH09891016               | 03/02/89               | 10.00 - 14 80                    | GRAVEL & SAND                       |
| 8200989                    | BH09891620               | 03/02/89               | 16.00 - 18.40                    | GRAVEL & SAND                       |
|                            |                          |                        |                                  |                                     |
| 8201089                    | BH10890003               | 03/09/89               | 0 00 - 2 60                      | SILTY SANDY CLAY                    |
| 8201089                    | BH10890106D              | 03/02/89               | 1 00 - 6.50                      | SILTY CLAY                          |
| 8201089                    | BH10890106               | 03/02/89               | 1 00 - 6 50                      | SILTY CLAY                          |

TABLE 3-5  
(Continued)  
BACKGROUND BOREHOLE SAMPLE INFORMATION

| <u>Sample Information</u> |                      |                    |                              |                                 |
|---------------------------|----------------------|--------------------|------------------------------|---------------------------------|
| <u>Borehole Number</u>    | <u>Sample Number</u> | <u>Sample Date</u> | <u>Depth Increment (ft.)</u> | <u>Lithological Description</u> |
| B201189                   | BH11890003           | 03/17/89           | 0 00 - 3 00                  | CLAY                            |
| B201189                   | BH11890309           | 03/17/89           | 3 00 - 9 00                  | CLAY                            |
| B201189                   | BH11890915           | 03/17/89           | 9 00 - 15 00                 | CLAY                            |
| B201189                   | BH118909150          | 03/17/89           | 9 00 - 15.00                 | CLAY                            |
| B201189                   | BH11891512           | 03/17/89           | 15 00 - 21 00                | CLAY                            |
| B201189                   | BH11892127           | 03/17/89           | 21 00 - 27 00                | CLAY                            |
| B201189                   | BH11892733           | 03/17/89           | 27 00 - 33 00                | CLAY                            |
|                           |                      |                    |                              |                                 |
| B201289                   | BH12890003           | 03/22/89           | 0 00 - 3 00                  | CLAY                            |
| B201289                   | BH12890307           | 03/22/89           | 3 00 - 6.80                  | SILTY CLAY                      |
| B201289                   | BH12898915           | 03/23/89           | 9 00 - 15 00                 | SILTY CLAY                      |
| B201289                   | BH12891521           | 03/23/89           | 15 00 - 20 65                | SILTY CLAY                      |
| B201289                   | BH128915210          | 03/23/89           | 15 00 - 20 65                | SILTY CLAY                      |
|                           |                      |                    |                              |                                 |
| B201489                   | BH13890003           | 03/10/89           | 0.00 - 3 00                  | SILTY CLAY                      |
| B201489                   | BH13890307           | 03/10/89           | 3.00 - 7 00                  | SILTY CLAY                      |
|                           |                      |                    |                              |                                 |
| B201589                   | BH14890003           | 03/15/89           | 0 00 - 3.00                  | SILTY CLAY                      |
| B201589                   | BH14890307           | 03/15/89           | 3.00 - 7 00                  | SILTY CLAY                      |
|                           |                      |                    |                              |                                 |
| B301889                   | BH15890003           | 03/07/89           | 0 00 - 3.00                  | SILTY CLAY                      |
| B301889                   | BH15890309           | 03/07/89           | 3 00 - 9 00                  | SILTY CLAY                      |
| B301889                   | BH15890915           | 03/07/89           | 9 00 - 15.00                 | SILTY CLAY                      |
| B301889                   | BH15891521           | 03/07/89           | 15.00 - 21.00                | SILTY CLAY                      |
|                           |                      |                    |                              |                                 |
| B401989                   | BH16890003           | 04/05/89           | 0 00 - 3.00                  | CLAY & GRAVEL                   |
| B401989                   | BH16890309           | 04/05/89           | 3.00 - 9 00                  | CLAY                            |
| B401989                   | BH16890915           | 04/05/89           | 9 20 - 13 30                 | CLAY                            |
| B401989                   | BH16891519           | 04/05/89           | 16.00 - 19.00                | SANDY GRAVELLY CLAY             |
|                           |                      |                    |                              |                                 |
| B302089                   | BH17890003           | 03/28/89           | 0.00 - 2.10                  | CLAY                            |
| B302089                   | BH17890306           | 03/28/89           | 3 60 - 6 00                  | CLAY                            |
|                           |                      |                    |                              |                                 |
| B402189                   | BH18890003           | 03/29/89           | 0.00 - 0.80                  | CLAY                            |
| B402189                   | BH18890307           | 03/29/89           | 3.30 - 7 30                  | CLAY                            |
|                           |                      |                    |                              |                                 |
| B201089                   | BH10890713           | 03/02/89           | 7 50 - 13.50                 | SILTY CLAYSTONE                 |
| B201089                   | BH10891319           | 03/02/89           | 13 50 - 19.50                | SILTY CLAYSTONE                 |
|                           |                      |                    |                              |                                 |
| B201189                   | BH11893541           | 03/23/89           | 34.50 - 41.00                | CLAYSTONE                       |
| B201189                   | BH11894146           | 03/23/89           | 41 00 - 46.00                | CLAYSTONE                       |

TABLE 3-5  
(Continued)  
BACKGROUND BOREHOLE SAMPLE INFORMATION

| <u>Sample Information</u>  |                          |                        |                                  |                                     |
|----------------------------|--------------------------|------------------------|----------------------------------|-------------------------------------|
| <u>Borehole<br/>Number</u> | <u>Sample<br/>Number</u> | <u>Sample<br/>Date</u> | <u>Depth<br/>Increment (ft.)</u> | <u>Lithological<br/>Description</u> |
| B201289                    | BH12892329               | 03/23/89               | 23.40 - 29.40                    | CLAYSTONE                           |
| B201289                    | BH12892930               | 03/23/89               | 29 00 - 29 90                    | CLAYSTONE                           |
| B201489                    | BH13891015               | 03/10/89               | 10/70 - 15 00                    | CLAYSTONE                           |
| B201489                    | BH13891015D              | 03/10/89               | 10/70 - 15.00                    | CLAYSTONE                           |
| B201489                    | BH13891519               | 03/10/89               | 15 00 - 19 20                    | CLAYSTONE                           |
| B201589                    | BH14890814               | 03/16/89               | 8 20 - 14 20                     | CLAYSTONE                           |
| B201589                    | BH14891417               | 03/16/89               | 14 20 - 17 00                    | SILTY CLAYSTONE                     |
| B301889                    | BH15892228               | 03/07/89               | 22 00 - 28.30                    | SANDY SILTY CLAYSTONE               |
| B301889                    | BH15892834               | 03/07/89               | 28.30 - 34.30                    | SANDY SILTY CLAYSTONE               |
| B401989                    | BH16892127               | 04/05/89               | 20 50 - 26.50                    | CLAYSTONE                           |
| B401989                    | BH16892733               | 04/05/89               | 26.50 - 32.50                    | CLAYSTONE                           |
| B302089                    | BH17891319               | 03/28/89               | 13 50 - 19 50                    | CLAYSTONE                           |
| B302089                    | BH17891319D              | 03/28/89               | 13 50 - 19 50                    | CLAYSTONE                           |
| B302089                    | BH17891925               | 03/28/89               | 19 50 - 25.50                    | CLAYSTONE                           |
| B401289                    | BH18890713               | 03/29/89               | 7.50 - 13 50                     | CLAYSTONE                           |
| B201289                    | BH12893032               | 03/23/89               | 29 90 - 32.00                    | SANDY SILTSTONE                     |
| B201489                    | BH13890709               | 03/10/89               | 7 00 - 9 30                      | SILTY SANDSTONE                     |
| B201589                    | BH14891720               | 03/16/89               | 17.00 - 20.00                    | CLAYEY SANDSTONE                    |
| B402189                    | BH18891319               | 03/29/89               | 13 50 - 19 50                    | SANDSTONE                           |

**TABLE 3-6**

**ANALYTE LIST FOR BACKGROUND BOREHOLE MATERIAL SAMPLES**

**METALS**

CLP Inorganic Target Analyte List  
(see Table 3-4)

Other Metals

Cesium  
Lithium  
Molybdenum  
Strontium  
Tin

**OTHER INORGANICS**

Cyanide  
pH  
Nitrate  
Sulfide

**RADIONUCLIDES**

Gross Alpha  
Gross Beta  
Strontium 89, 90  
Cesium 137  
Radium 226, 228  
Uranium 233, 234, 235, 238  
Americium 241  
Plutonium 239, 240  
Tritium

## SECTION 4

### DATA QUALITY

#### 4.1 QUALITY ASSURANCE/QUALITY CONTROL PRACTICES

The 1989 background geochemical characterization program was conducted in accordance with the ER Program Quality Assurance/Quality Control (QA/QC) Plan (Rockwell International, 1989a) and with Standard Operating Procedures (SOPs) (Rockwell International, 1989b). Sampling and analysis activities were implemented using these procedures to document and assure the precision, accuracy, comparability, completeness, and representativeness of the data.

Analytical data were generated using EPA and other well-established methods identified in the QA/QC Plan. EPA Contract Laboratory Program (CLP) methods and protocols were used in the analysis of target analyte list (TAL) metal parameters. Background samples were not analyzed for organic compounds in 1989. Methods for non-CLP analytes, for example, major ions and radionuclides, are based on EPA and other published references. The analytical data were reviewed and validated independently of the laboratory, and the results were documented in data validation reports. EPA data validation functional guidelines were used for validating metals data for CLP analytes. Non-CLP analytical data were validated using data validation guidelines developed by the ER Program because such guidelines have not been published by EPA. These non-CLP guidelines are based on EPA validation functional guideline concepts and tailored to non-CLP analytical methods.

Three classes of data quality are used in the ER Program: (1) V--Valid and usable without qualification, (2) A--Acceptable for Use with Qualification(s), and (3) R--Rejected (unacceptable). Valid data meet the following objective standards, where applicable:

- \*1 analytical methods followed,
- 2 acceptance criteria achieved,
- 3 sufficient number and type of QC samples analyzed,
- \*4 QC limits achieved,
- \*5 compounds and analytes correctly identified,
- \*6 equipment/instrumentation calibration criteria achieved, and
- 7 sample holding times met

\* primary validation criteria

Data that are acceptable with qualifications meet most, but not all, of the above standards. At the minimum, all of the primary validation criteria are achieved within acceptable limits. Rejected data fail to meet primary validation criteria. As shown in Appendix D, analytical results are coded with the appropriate data qualifier (V, A, or R) based on the results of the data validation. For the purposes of the background geochemical characterization, valid and acceptable data were considered of equal utility. Except for radiochemistry, rejected data have not been used in any statistical computations (see Section 4.2). However, it should be noted that data that have not yet been validated have been used in the statistical computations out of necessity, i.e., to provide an adequate quantity of data for statistical analysis with an acceptable level of confidence. Use of unvalidated data should not reduce the soundness of the conclusions drawn because most of the data that have been validated are either valid or acceptable. The only exception is in the case of gross alpha and gross beta measurements where all of the data that have been validated, have also been rejected (see Section 4.2). Determination of contamination in any environmental medium at the Rocky Flats Plant based on gross alpha and beta alone must be considered preliminary in light of these results.

#### 4.2 STATUS OF DATA VALIDATION

Appendix D summarizes the data validation status for ground water, surface water, sediments and soils. For every parameter that was analyzed, this appendix provides the percentage of validated data, and percentage of valid, acceptable, and rejected data.

Excepting radionuclide data, greater than 85% of the ground water data have been validated. However, less than 3% of the radionuclide data have been reviewed. For the dissolved metals, the rejected data range

from 0% to 32% (aluminum) In all instances, only data that show non-detection of the metal have been rejected (This is not to say that all non-detect metals data have been rejected) The data have been rejected because of negative bias in the blanks, i.e., the blanks were producing negative instrument readings rendering determination of non-detected ("zero" instrument readings) for the samples inconclusive The three nitrate-nitrite concentrations that were rejected are due to calibration verification documentation not being available

Only three gross alpha and beta concentrations were rejected The data were rejected because the lab control samples fell outside the three sigma control limits Two americium concentrations were rejected because of unacceptably low chemical recoveries

With the exception of the radionuclide data, 70 to 93% of the surface water data have been validated None of the dissolved radionuclide data were validated, and less than 20% of the total radionuclide data were validated The fraction of rejected dissolved and total metals data are similar to the ground water metals data The reason for the rejection is the same, i.e., negative bias in the blanks With the exception of cyanide, the inorganics data were qualified as valid or acceptable Twelve percent of the cyanide data were rejected because of unacceptably low matrix spike recoveries The gross alpha and beta data were rejected primarily because the self absorption (calibration) curve was out-of-date The four rejected americium data were results of unacceptably low chemical recoveries

Most of the total metals and inorganics sediment and soils data have been validated, however, none of the radionuclide data have been validated Again, total metals data were rejected due to negative bias in the blanks All of the sediments inorganics data that were validated, were valid In contrast, 9% of the soils sulfide data were rejected because the raw data indicated that sulfide was actually not present in the samples, contrary to the analytical report

#### 4.3 FIELD QUALITY CONTROL SAMPLES

During the background field investigation program, field blank and field duplicate quality control samples were collected in accordance with the QA/QC Plan. Field blanks are used to monitor for sample cross-contamination and the effectiveness of the decontamination process. The blanks are collected by rinsing decontaminated sampling equipment with distilled/deionized water, placing it in the appropriate container, and preserving as required.

With respect to ground water and surface water samples, the field duplicates are collected following the actual sample collection using the same sampling technique. For soil samples, it is necessary to split the core of the interval being sampled, with the sample and duplicate collected from each of the splits using the same technique. The data from the sample and duplicate provide a measure of the sampling precision and sample homogeneity, i.e., the amount of error in the data attributed to sampling technique, or to variability in the analyte concentration in the medium being sampled.

Precision is quantified by calculating the relative percent difference, i.e., the quotient of the difference between the duplicate analytical results and the average of those results for the given analyte expressed as a percentage.

$$\% \text{ RPD} = 100(C1 - C2)/(C1 + C2)/2$$

where

RPD = Relative percent difference

C1 = Concentration of analyte in the sample

C2 = Concentration of analyte in the duplicate

The QC criterion for laboratory duplicates is a +/- 20% RPD for water duplicates and +/- 35% RPD for soil. These limits have also been applied to field duplicates, for discussing the results. Appendix D provides the data for the field blanks and duplicates and the results are discussed below.

The ground water quality control samples generally show an absence of contamination in the blanks and good precision between the duplicate sample data. With the exception of one field blank in which the mercury concentration is 0.0023 mg/l (sample G31890589001FB), the field blank data show analytes are generally not detected, or detected near or estimated below the detection limits. That is to say, the blanks are generally non-detect. The RPDs are also below  $\pm 20\%$  with few exceptions. The more obvious exceptions are in the iron and zinc data but even in these cases, most of the RPDs are below the criterion. The radionuclide data is difficult to assess with respect to precision because most of the data have large associated error terms (of similar magnitude to the values) and therefore the actual concentration is uncertain. The only large discrepancy between the sample and the duplicate in the inorganics data is for sample G15890589001 where the total dissolved solids data differ by an order of magnitude. This would appear to be a transcription error and is being investigated.

With respect to surface water, QC samples generally show non-detect blanks and low RPDs. Of note, however, is field blank SW108002FB (total metals) and the duplicates for the sulfate data. This field blank shows significant concentrations of several metals, and from the magnitude of the concentrations, the field blank appears to be a mislabeled sample. Again, this is being investigated. For unknown reasons, several of the sulfate duplicate pairs show poor agreement ( $RPD > 100\%$ ), however, the other pairs show excellent agreement.

The sediment QC samples show non-detect field blanks and poor precision with respect to aluminum, iron, vanadium, and zinc, and to a lesser extent copper and lead. These were the only metals detected and implies that there is heterogeneity in the sediment being sampled, or that the variability arises from the sampling technique.

Like the sediments, the field blanks are generally non-detect, however, the precision for several of the metal concentrations is poor. The few exceptions to non-detect field blanks include samples BH17890328FB

(aluminum - 300 mg/l), BH11890317FB (zinc - 33.2 mg/l), and BH12890323FB (zinc - 0.947 mg/l). The reason for the occurrence of these metals in these field blanks is not known. The metals showing the most frequent occurrence of RPDs greater than 20% are iron, manganese, molybdenum, nickel, and zinc. Unlike the sediments, these are not simply the metals that were frequently detected. Because the precision for the other metals is generally good, it is presumed that the variability is inherent in the volume of soil being sampled.

#### 4.4 IDENTIFICATION OF OUTLIERS

As part of the initial review data were grouped by sample type (ground water, etc.) and by chemical group (dissolved metals, etc.). Within each chemical group data were ranked in descending concentration by analyte. The top five concentrations for each analyte were manually compared with the original laboratory analytical reports to check for potential outliers and to check the integrity of the database.

Outlier testing was also performed on each analyte within each chemical group and sample medium by the single outlier test defined in ASTM (1975) and described in the RCRA guidance document (EPA, 1989). Outliers identified with the single outlier test were also identified by the ranking procedure, and were therefore checked against the original laboratory data.

Outliers that were transcription errors, laboratory errors, or database errors were corrected in the database. All other outliers that could not be explained as errors were retained in the dataset as suggested by (EPA, 1989). Background sampling stations and wells were chosen upgradient or upstream of plant operations and are assumed to be unimpacted by plant operations. Therefore, outliers that are not explained as errors should be included in the dataset because they represent natural background chemical variability. Results of the ASTM outlier test are reported in Appendix C.

#### 4 5 GEOCHEMICAL DATA QUALITY CRITERIA

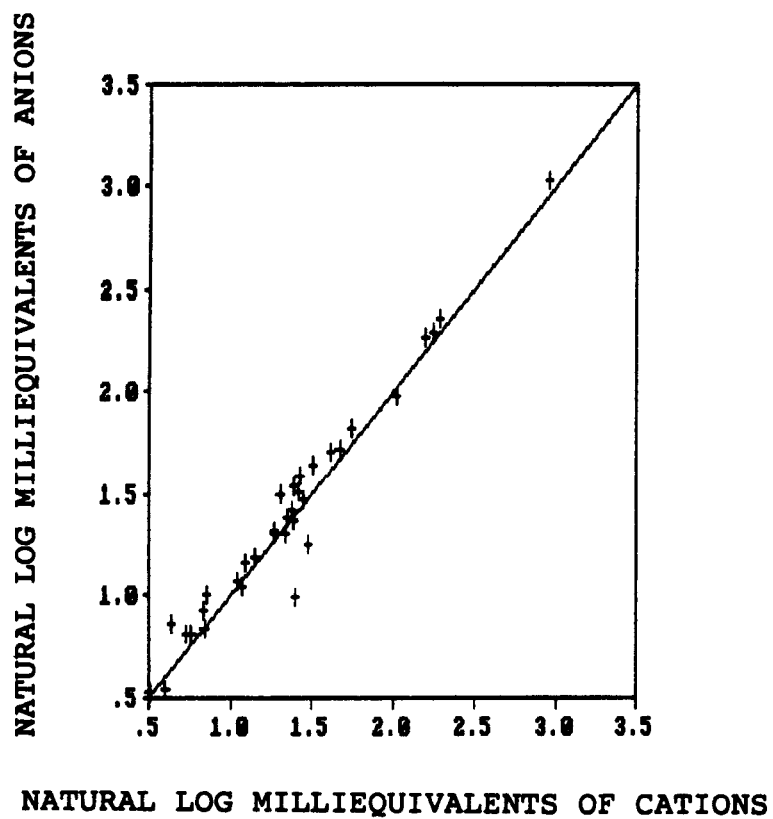
Together with the QA/QC practices outlined in Section 4 1, other criteria are used to assess general data quality for use in geochemical interpretation. Some of the standard practices discussed below include calculating cation-anion balances, comparing TDS measured in the laboratory with TDS calculated from analytical results, and comparison of specific conductance versus TDS. The purpose of these techniques is to further check the consistency of the data, and to help identify transcription errors, field or lab instrument deficiencies, and other potential problems with the data. Another purpose is to explore the data for trends and relationships that indicate incomplete analyses, or geochemical changes between field measurements and lab measurements.

##### 4 5 1 Ground Water Quality Criteria

The natural log of total milliequivalents of cations is plotted against the corresponding value for anions on Figure 4-1 as a quality check of the ground water data. The ideal case of zero charge balance error and electrical neutrality is indicated by the position of the 45 degree line. The data points follow the 45 degree line quite closely, although most of the points fall on the anion side of the line. This indicates an excess of negatively charged species, according to the laboratory data. Thus either one or more anions are being overestimated by the laboratory, or one or more cations are being underestimated. The charge balance calculations incorporated all major ions as well as some lesser ions selected after reviewing the dataset. Cations included in the summation included  $\text{Ca}^{++}$ ,  $\text{Mg}^{++}$ ,  $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{Fe}^{++}$ ,  $\text{Sr}^{++}$ , and  $\text{Cs}^+$ . Anions included  $\text{HCO}_3^-$ ,  $\text{CO}_3^{--}$ ,  $\text{Cl}^-$ ,  $\text{SO}_4^{--}$ , and  $\text{NO}_3^-$ . For all ions the conversion factors between milligrams per liter and milliequivalents per liter were taken from Hem (1989).

Percent charge balance error is computed by the equation,  $(100)(\text{cations}-\text{anions})/(\text{cations}+\text{anions})$  where "cations" and "anions" represent the milliequivalent sum of cations and anions, respectively. Charge balance errors might be expected to increase with the total dissolved solids (TDS) content, however, Figure

**FIGURE 4-1**  
**CATION-ANION BALANCE IN GROUND WATER**



4-2 does not indicate any such pattern. Both the mean and median charge balance errors are only about -2% and most of the points indicate less than 10% error. This indicates that the analyses are reasonably accurate.

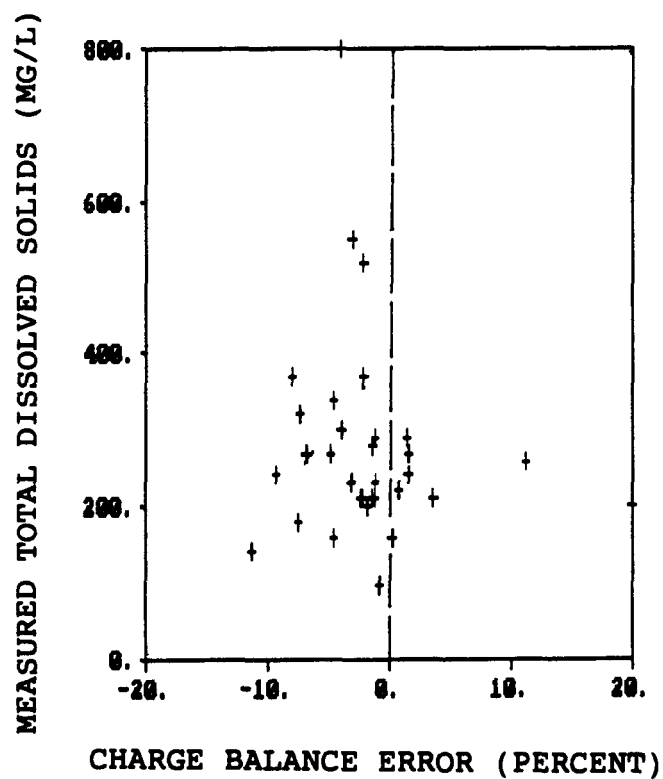
Figure 4-3 compares analyzed (measured) total dissolved solids (TDS) against calculated TDS. Although there is considerable scatter in the data, the points appear to cluster along the theoretical line. However, most of the points fall on the analyzed side of the 45 degree line rather than on the calculated side, suggesting that there may be additional solids in the water that have not been specifically identified and analyzed for. Dissolved silica, for example, was not analyzed in 1989 ground water samples at Rocky Flats. Preliminary data from 1990 suggests that dissolved silica in Rocky Flats ground waters may reach concentrations of 60 mg/L.

The calculated versus measured TDS balance in Rocky Flats ground water should improve in the 1990 field season with the addition of new analytes including silica, orthophosphate, and fluoride among others.

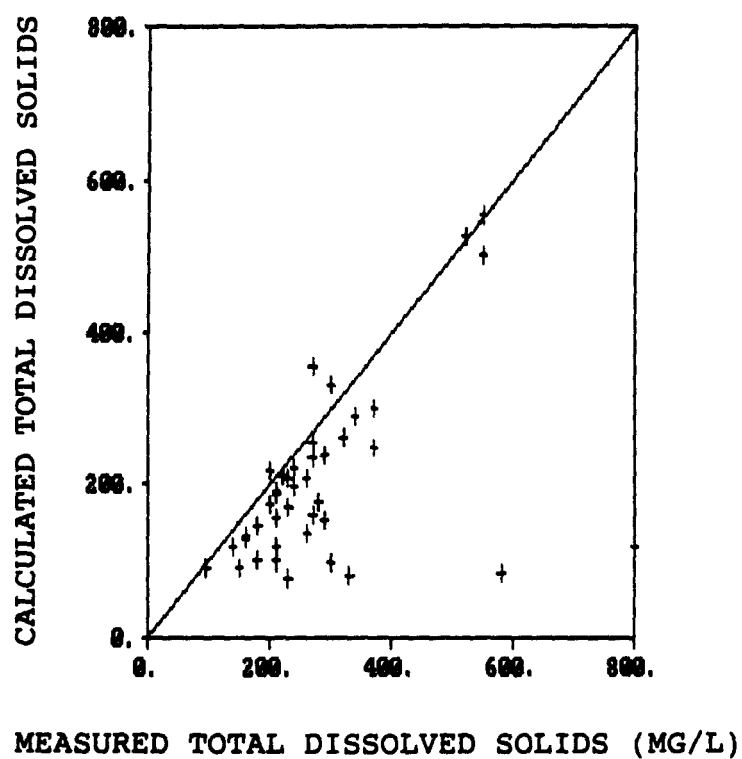
Field conductivity values at various temperatures have been corrected to specific conductance in micromhos/cm at 25°C according to the equation,  $SC = COND + (0.02 * COND * (25 - T))$ . In this equation from EPA (1983), "SC" is specific conductance, and "COND" is conductivity at sample temperature "T" degrees C. Specific conductance (SC) is often highly correlated with total dissolved solids in the geochemical literature (Hem, 1989). However, Figure 4-4 indicates a rather poor correlation between SC and TDS in ground waters from Rocky Flats. The field equipment used to measure conductivity in 1989 is believed to be responsible for the poor correlation and has since been upgraded to include temperature compensation.

Figure 4-5 plots pH measured in the field versus pH measured in the laboratory. Because pH is often an unstable parameter (poorly buffered) in natural waters, the agreement between field and laboratory data is actually better than expected. That is, approximately equal numbers of points fall on both sides of the 45 degree line.

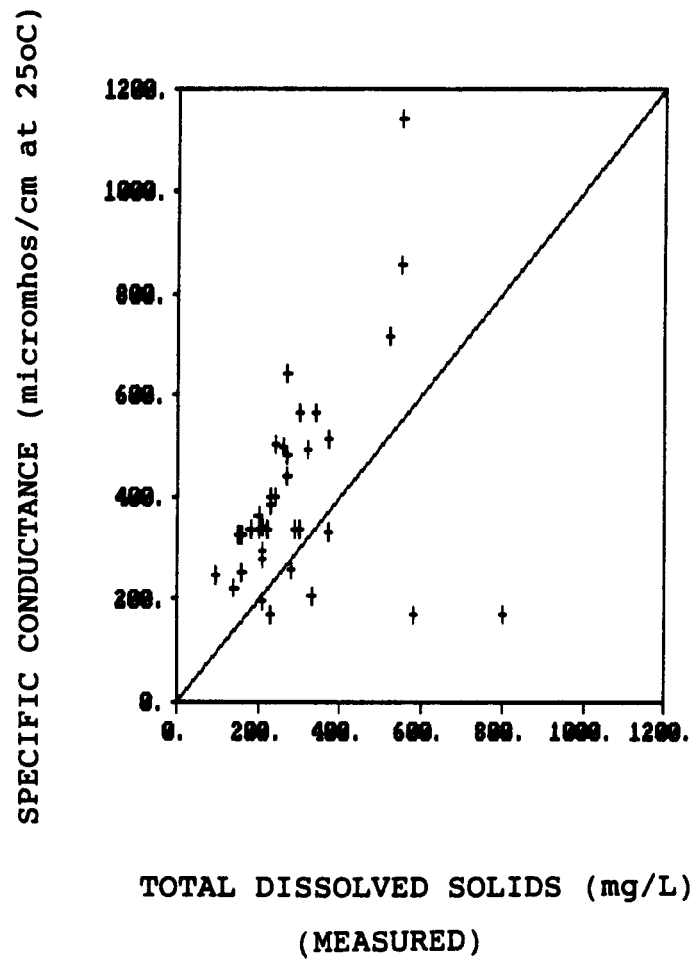
**FIGURE 4-2**  
**CHARGE BALANCE ERROR VS TOTAL DISSOLVED SOLIDS**  
**IN GROUND WATER**



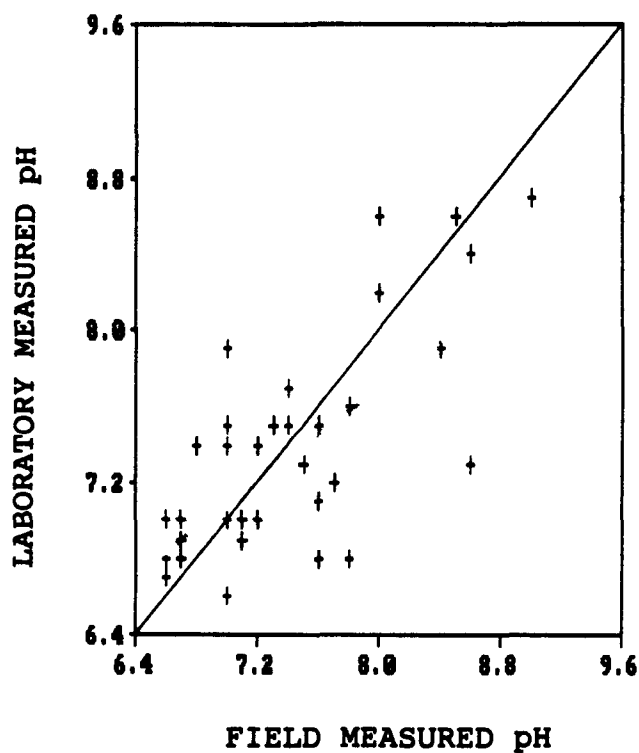
**FIGURE 4-3**  
**COMPARISON OF MEASURED AND CALCULATED**  
**TOTAL DISSOLVED SOLIDS IN GROUND WATER**



**FIGURE 4-4**  
**SPECIFIC CONDUCTANCE VS TOTAL DISSOLVED SOLIDS**  
**IN GROUND WATER**



**FIGURE 4-5**  
**COMPARISON OF FIELD MEASURED PH VS LABORATORY MEASURED PH**  
**IN GROUND WATER**



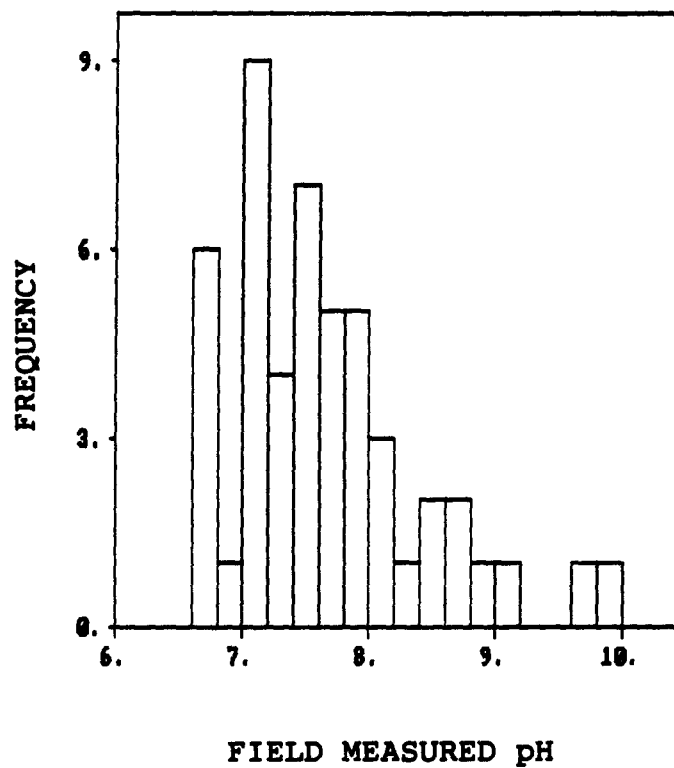
Because ground water pH is often poorly buffered, it is an unstable parameter, and the field-measured pH should always be used in preference to the laboratory pH which is measured days later. The pH of a water sample often changes not only with temperature, but with gas exchange and with precipitation of solids (for example,  $\text{CaCO}_3$ ) from the sample. Ground waters are often rich in dissolved  $\text{CO}_2$  which degases at the lower pressures and warmer temperatures usually found at the ground surface and in the laboratory. Ignoring other effects, the loss of  $\text{CO}_2$  acts to raise the pH. Thus laboratory measured pH values are often found to be one or two pH units higher than the pH of a ground water measured in situ. This behavior is not observed on Figure 4-5.

A histogram of pH values in ground water is shown on Figure 4-6. An outlier at pH 10.4 was excluded from the histogram. The distribution is reasonably normal with a mean of approximately pH 7.6. Most of the ground water pH values lie in the range 6.6 to 8.0 pH units.

EG&G selected 50 wells on the site during the first quarter 1990 to measure both filtered and unfiltered total alkalinity in the field. The purpose was to determine if suspended solids in the ground water sample could account for part of the total alkalinity of the sample. The data could be used to explain differences in field and lab parameters, and differences between measured and calculated TDS. Filtered samples were passed through a standard 0.45  $\mu\text{m}$  filter prior to alkalinity measurement. Total alkalinity was measured in the field using an ORION Total Alkalinity Test Kit #700010. Figure 4-7 shows an excellent correlation between filtered and unfiltered total alkalinity over a wide range of values, suggesting that suspended material greater than 0.45  $\mu\text{m}$  is not contributing to total alkalinity.

Figure 4-8 compares filtered versus unfiltered alkalinity for 11 background wells included in the test, and shows good correlation between the two analyses. Well B400289 may have some suspended material resulting in elevated unfiltered alkalinity. In general, the data indicate that suspended material is not contributing to alkalinity for both background and nonbackground ground water.

**FIGURE 4-6**  
**HISTOGRAM OF FIELD MEASURED PH IN GROUND WATER**



**FIGURE 4-7**  
**SCATTERGRAM OF FILTERED VS UNFILTERED ALKALINITY FOR 50 WELLS, 1990**

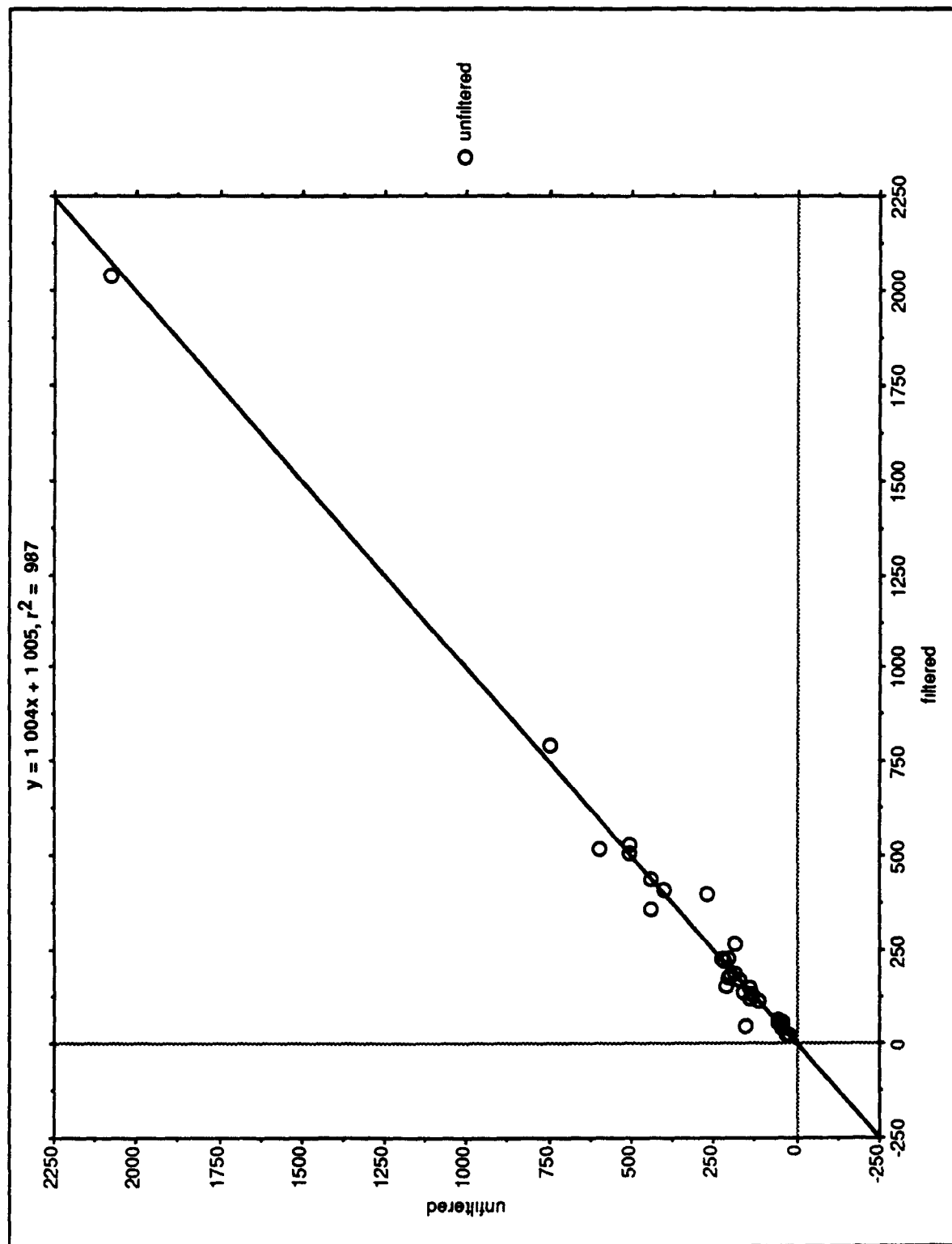
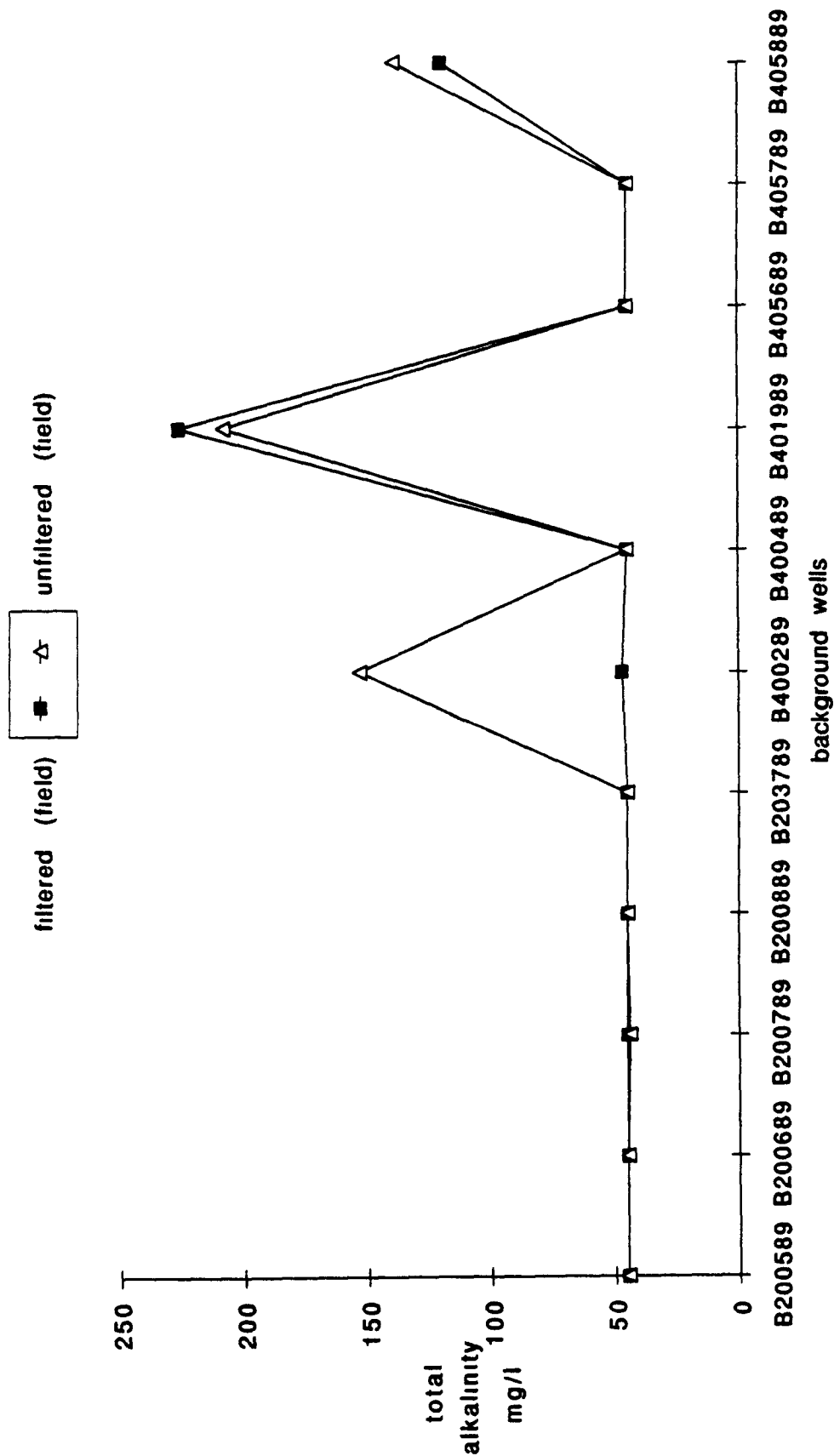


FIGURE 4-8

COMPARISON BETWEEN FILTERED AND UNFILTERED TOTAL ALKALINITY MEASUREMENTS  
FOR SELECTED BACKGROUND WELLS



#### 4.5.2 Surface Water Quality Criteria

Figure 4-9 provides a quality check of surface water analytical data by plotting the natural log of cation milliequivalents versus that for anions in surface water samples. If the analyses were accurate and precise all the points would plot along the 45 degree line where cation milliequivalents equal anion milliequivalents. The correlation is generally good, however, most of the points fall on the anion side of the line indicating an excess of negatively charged species in the analytical data.

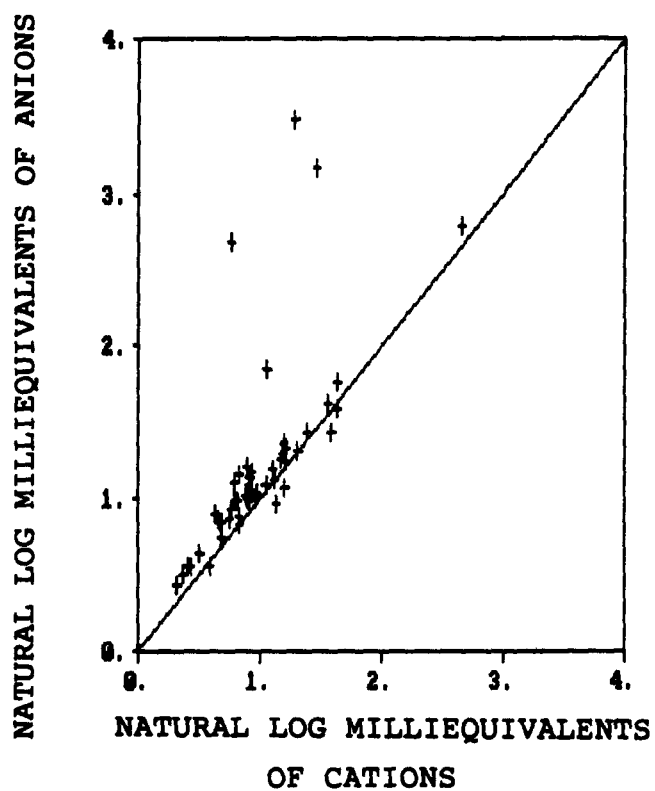
Another view of surface water data quality is provided by Figure 4-10 in which percent charge balance error is plotted versus the total dissolved solids (TDS) content of the water. There does not appear to be any correlation between TDS and error. Because of a half dozen outliers, the mean percent error is about -9.8%. This negative value means that on average anions exceed cations by 9.8%. Use of the median value of -5.8% may be more representative in this case, since it is less influenced by large outliers.

Figure 4-11 compares the measured TDS with that computed from surface water analytical data. Ideally, the data points should lie along the 45 degree line. The fact that most of the values fall on the measured TDS side of the line implies that one or more important analytes may not have been analyzed. Therefore, the corresponding calculated TDS is usually smaller. As mentioned in the discussion of ground water quality, silica was not analyzed in 1989. Silica, as well as orthophosphate and fluoride analyses have been added to the 1990 field program for surface water.

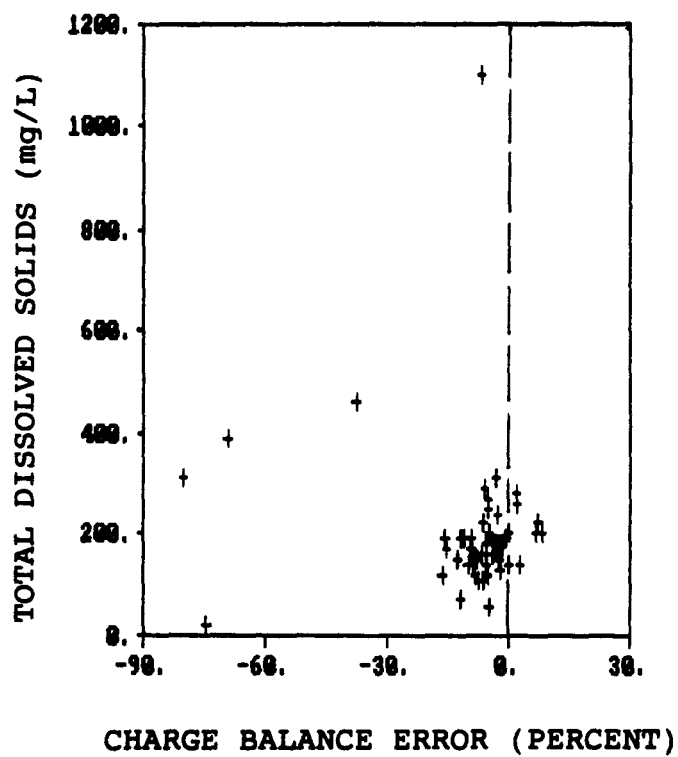
Figure 4-12 plots the natural log of specific conductance against the log of TDS. A linear relationship is expected but not observed for these surface waters.

Figure 4-13 indicates that there is almost no correlation between field-measured pH values and those later measured in the laboratory. This may be the case because the pH of natural waters tends to be an unstable parameter which is best measured in situ, or as soon after sampling as possible.

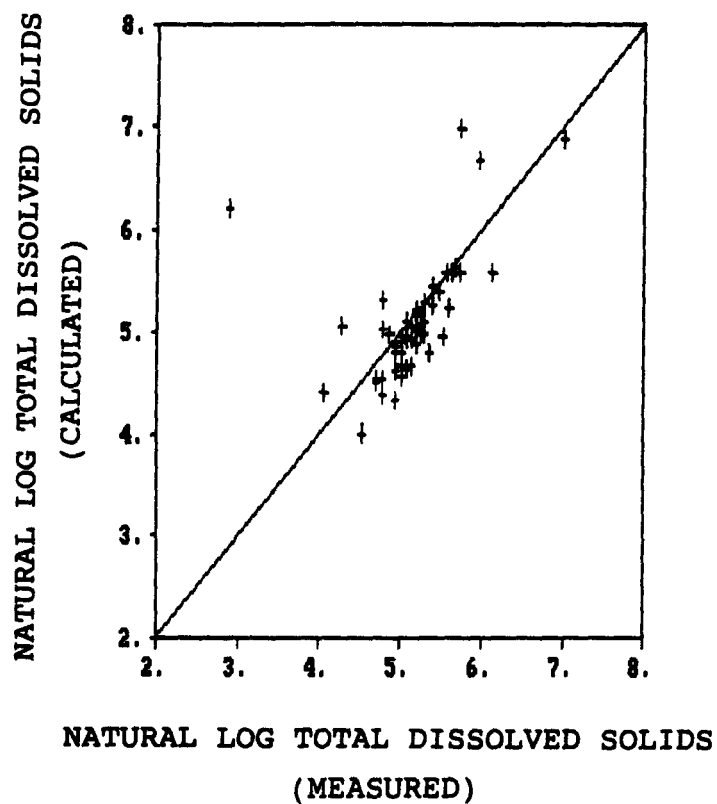
**FIGURE 4-9**  
**CATION-ANION BALANCE IN SURFACE WATER**



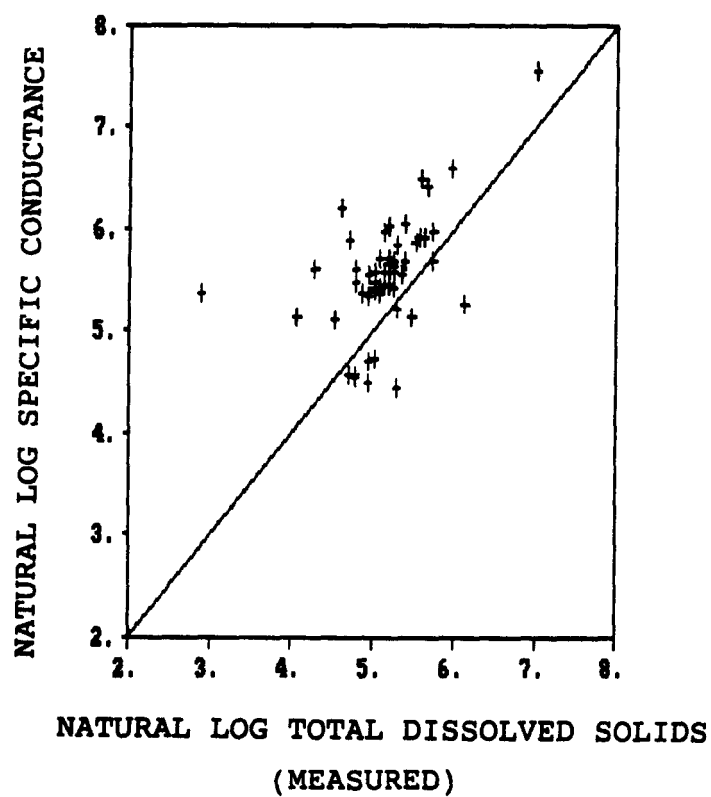
**FIGURE 4-10**  
**CHARGE BALANCE ERROR VS TOTAL DISSOLVED SOLIDS**  
**IN SURFACE WATER**



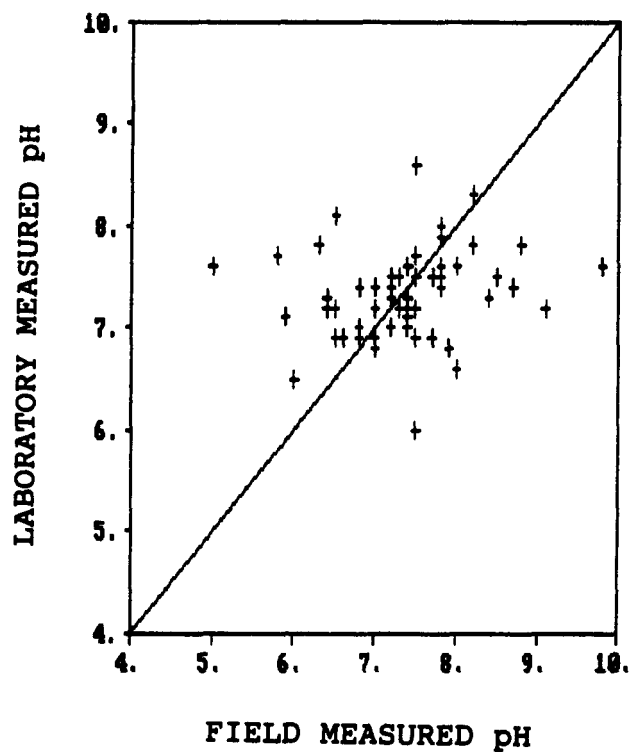
**FIGURE 4-11**  
**COMPARISON OF MEASURED AND CALCULATED TOTAL DISSOLVED SOLIDS**  
**IN SURFACE WATER**



**FIGURE 4-12**  
**SPECIFIC CONDUCTANCE VS TOTAL DISSOLVED SOLIDS**  
**IN SURFACE WATER**

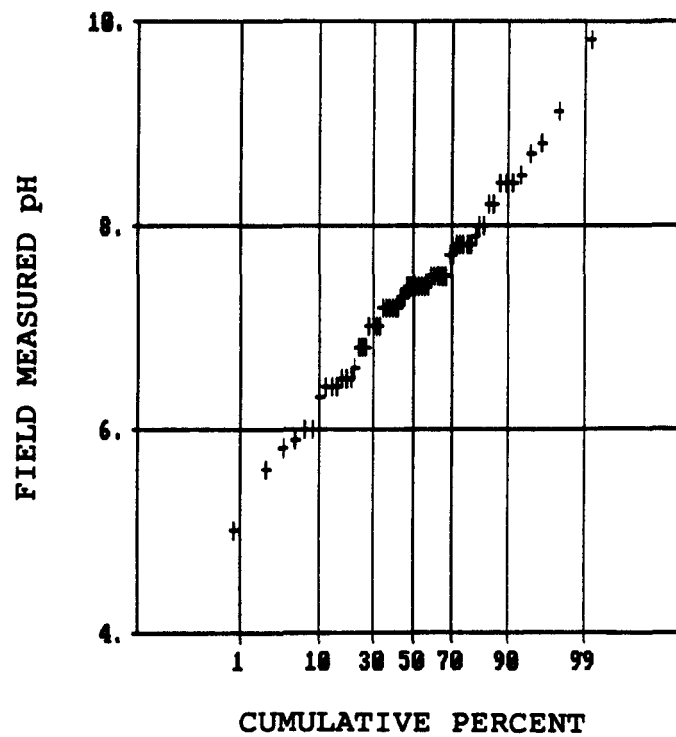
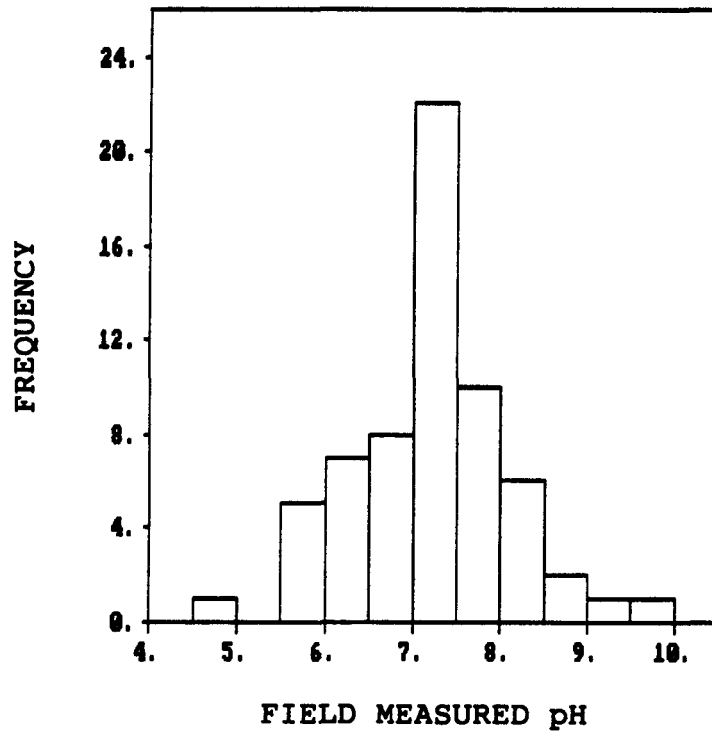


**FIGURE 4-13**  
**COMPARISON OF FIELD MEASURED PH VS LABORATORY MEASURED PH**  
**IN SURFACE WATER**



A histogram and normal probability plot of field-measured pH values for Rocky Flats surface waters are shown on Figure 4-14. The mean pH is approximately 7.3 pH units. Because pH is defined as the negative log of hydrogen ion activity, the linear probability plot indicates that hydrogen ion is log normally distributed, and pH is normally distributed in these waters.

**FIGURE 4-14**  
**HISTOGRAM AND PROBABILITY PLOT OF FIELD MEASURED PH**  
**IN SURFACE WATER**



## **SECTION 5**

### **BACKGROUND CHEMICAL CHARACTERIZATION**

#### **5.1 INTRODUCTION**

Concentrations of chemicals in ground water, surface water, sediment, and borehole materials were measured to establish background conditions in each medium. Chemical concentrations and a discussion of the general geochemical characteristics of each sample medium are summarized in the following sections. This evaluation is based on data received as of October, 1990 and includes results obtained from three rounds of ground water, nine rounds of surface water, one round of borehole sampling, and two rounds of sediment sampling. All analytical data are tabulated in Appendix A.

As outlined in Section 3.0, the chemical analyses were classified by the spatial location and lithology of the sample. Each sample medium was tested for statistically significant differences in chemistry as follows: surface water and sediments were tested for differences between sample locations in the north versus those in the south buffer zone; Borehole materials and ground water samples were tested for differences between lithologic units, and between locations (North Rocky Flats versus South Rocky Flats). Figure 2-1 shows the logical path and statistical methods used to determine differences between groupings. Output from the statistical tests, geological, and hydrogeological information are used below to determine the groupings. Results from MANOVA, ANOVA, multiple comparisons, or Test of Proportions are presented in Tables 5-1 through 5-7 below, and tolerance intervals together with summary statistics are included under the appropriate sections. Tolerance interval calculations are presented in Appendix B.

#### **5.2 GROUND WATER**

##### **5.2.1 Statistics**

Background ground water monitoring wells in North and South Rocky Flats were completed in Rocky Flats Alluvium, valley fill, colluvium, weathered claystone, weathered sandstone, and unweathered sandstone.

Ground water samples, collected over three quarters, from each of the well completion lithologies are compared against each other for geochemical differences and ground water samples from North Rocky Flats are compared against samples from South Rocky Flats. Dissolved metals, dissolved radionuclides, and inorganics are included in the statistical analyses.

Analytes in ground water with over 50% detectable concentrations include Ca, Mg, Mn, Na, Am241, Cs137, gross alpha, gross beta, Pu239, Ra226, Sr89/90, tritium, U235, U238, Cl, HCO<sub>3</sub>, NO<sub>3</sub>/NO<sub>2</sub>, SO<sub>4</sub>, and pH. Analytes with less than 50% detectable concentrations, but greater than 10% detects are Al, Ba, Fe, Pb, Li, Hg, K, Se, Sr, and Zn. Sb, As, Cd, Cs, Cr, Co, Cu, Mo, Ni, Ag, Tl, Sn, V, Ra228, U233/234, and Cyanide had less than 10% detectable concentrations or fewer than three samples.

The distributions for analytes with over 50% detectable concentrations are examined for normality or lognormality. Cs137 and tritium are normally distributed in ground water and HCO<sub>3</sub> is lognormally distributed. Ca, Mg, Mn, Na, Am241, gross alpha, gross beta, Pu239, Ra226, Sr89/90, U235, U238, Cl, NO<sub>3</sub>/NO<sub>2</sub>, SO<sub>4</sub>, and pH do not have a distinct normal or lognormal distribution. Ca, Mg, Mn, Na, Cl, NO<sub>3</sub>/NO<sub>2</sub>, and SO<sub>4</sub> resemble a lognormal distribution, while the other analytes resemble a normal distribution.

The null hypothesis of homogeneity of variances (homoscedasticity) for ground water analytes in North and South Rocky Flats was tested within each well completion lithology and by sampling quarter. Analytes with over 50% detects were used in the testing. For those analytes which do not have a normal or lognormal distribution, the test may detect anormality instead of heterogeneity of variances. Only Cs137, tritium, and HCO<sub>3</sub> appear to have homogeneity of variances between North and South Rocky Flats within each lithologic group over time.

A Multivariate Analysis of Variance is not performed for the ground water data due to an inadequate number of analytes meeting the assumptions of normality, homogeneity of variances, and independence.

Nonparametric and Parametric ANOVA's are performed for analytes with more than 50% detectable concentrations. The null hypotheses tested are of no ground water geochemical differences between North and South Rocky Flats and no geochemical differences between each well completion lithology. To test for these differences, a parametric ANOVA is performed for only Cs137, tritium, and  $\text{HCO}_3$ . All other analytes do not meet one or more of the assumptions for a parametric ANOVA, so a nonparametric ANOVA is performed instead. All analytes, except Cl, show no statistically significant difference between North and South Rocky Flats. However, all analytes except Mn, Cs137, Pu239, Ra226, Sr89/90, and tritium, show a statistically significant difference in groundwater lithologies. Following the logic outlined in Table 2-1, multiple comparison tests are run between lithologic groups for each analyte. The tests show a statistically significant geochemical difference exists between lithologic groups. In other words, each of the ground waters (as identified by the well completion lithology) appears to be different from the others and no clear grouping is evident among lithological units.

Ground water analytes with less than 50% detectable concentrations but greater than 10% detects were analyzed using Fisher's exact test and a Chi-square test. The null hypotheses tested are, (1) the proportion of nondetects in South Rocky Flats is equal to the proportion of nondetects in North Rocky Flats, and (2) the proportion of nondetects in each lithologic group is independent of the proportion of nondetects in the other lithologic groups. The results indicate that there is no statistically significant difference in the proportion of nondetects between North and South Rocky Flats, and no statistically significant difference in the proportion of nondetects in each ground water type.

Tables 5-1 through 5-3 summarize the statistical techniques, distributions, and results of the analyses for all analytes with more than 10% detects. A probability value from tests between locations and lithological units is provided for reference. Since the majority of analytes with more than 50% detects show a statistical difference between ground water classes, Rocky Flats alluvium, colluvium, valley fill, weathered claystone, weathered sandstone, and unweathered sandstone are considered statistically different in ground water geochemistry. Ground water geochemistry for Chloride is different between North and South Rocky Flats, but North and South Rocky Flats are similar in ground water geochemistry for all other analytes.

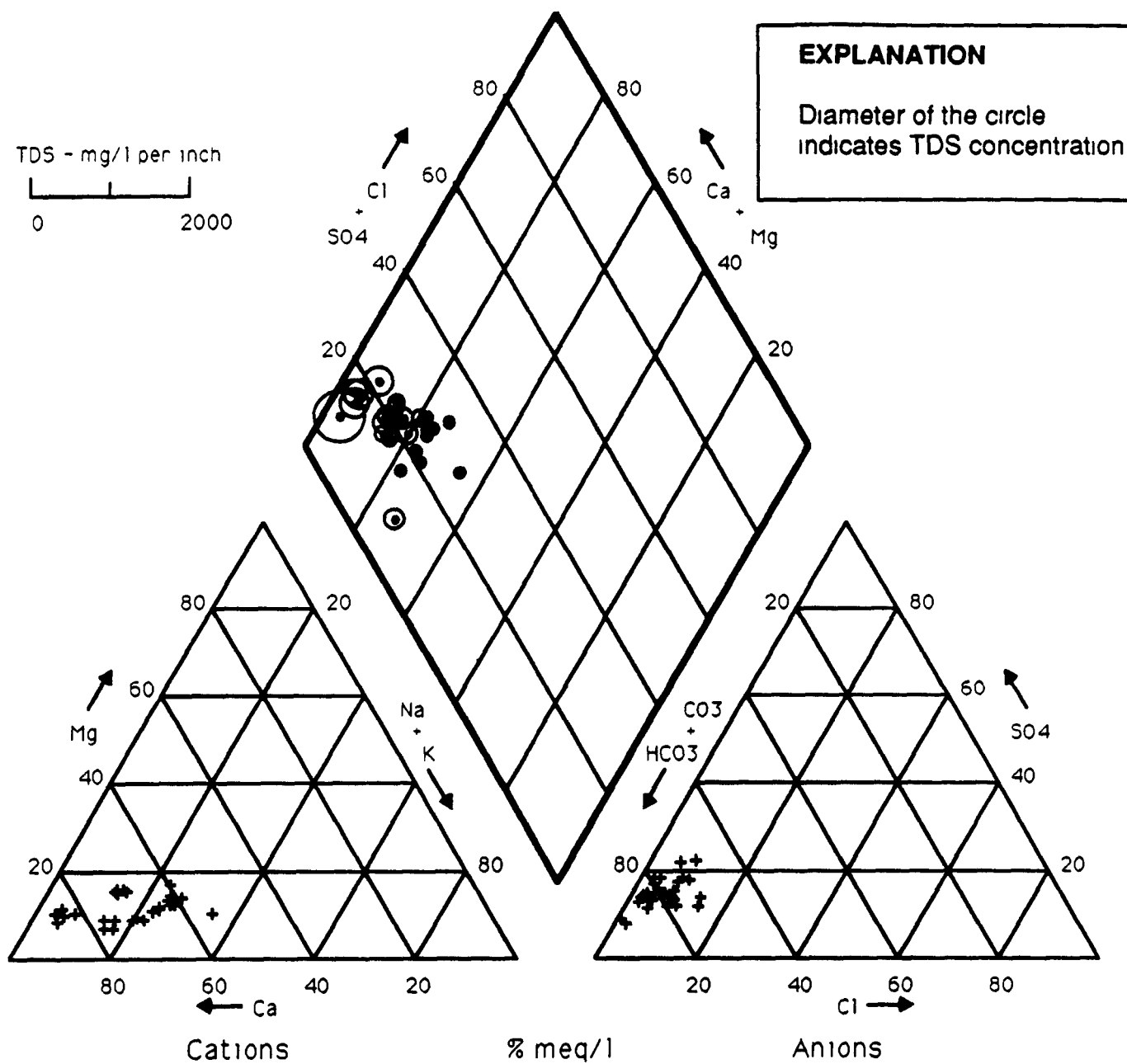
## 5 2 2 Major Ion Geochemistry

Major ion geochemistry for the ground water subgroups suggests that only the unweathered sandstone ground water can be consistently classified as a different hydrochemical facies from the other subgroups. Five trilinear diagrams are presented (Figures 5-1 through 5-5) that show 1989 mean values for major ions from Rocky Flats Alluvium ground water, valley fill ground water, colluvium ground water, weathered claystone and sandstone ground water combined, and unweathered sandstone ground water. Inspection of these plots indicates that Rocky Flats Alluvium ground water samples plot in the calcium bicarbonate field, and contain lower TDS concentrations than the other subgroups. Colluvium ground water and valley fill ground water are more saline than Rocky Flats Alluvium ground water, and can also be classified as primarily bicarbonate to calcium bicarbonate water.

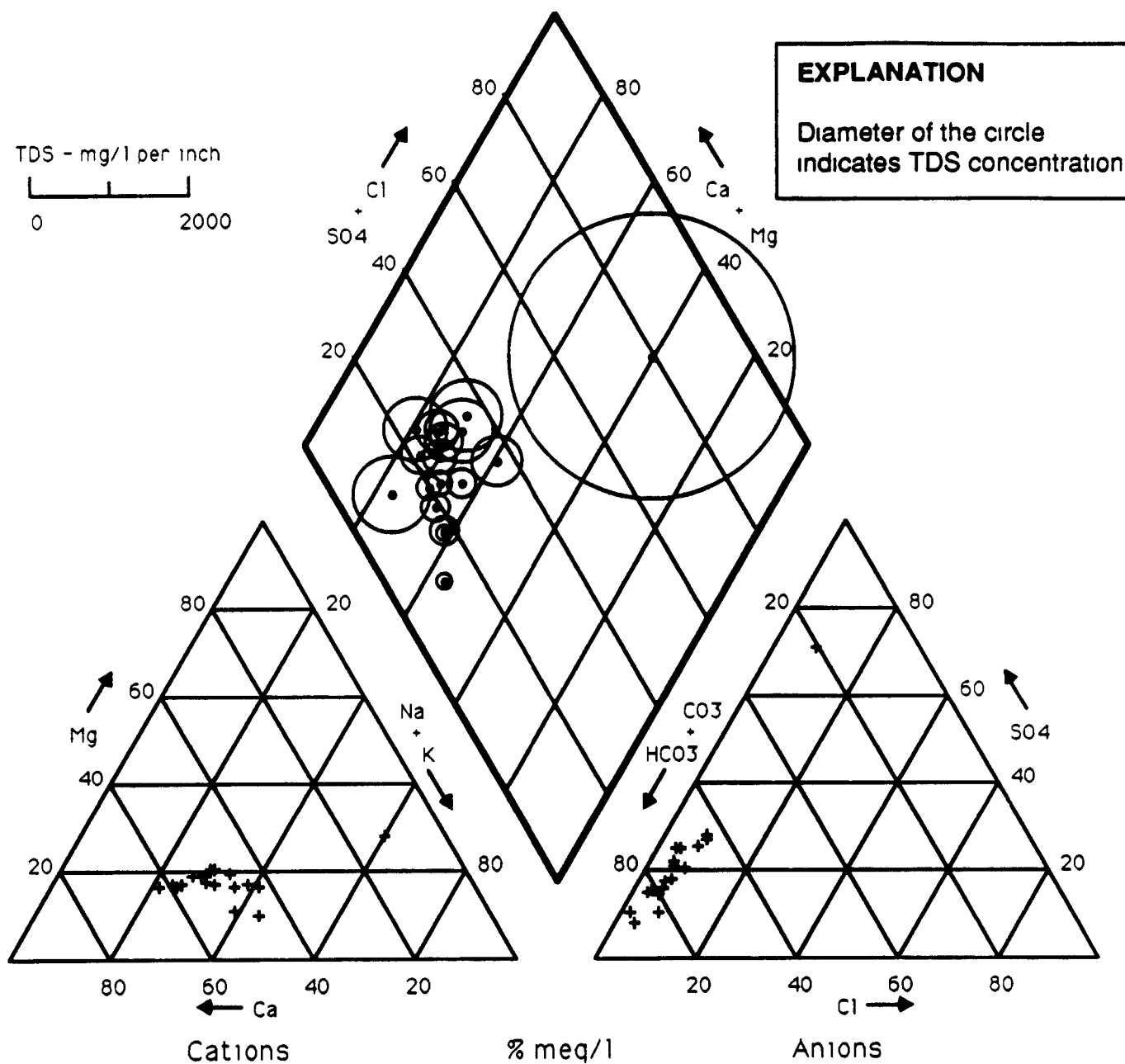
Outliers to these general classifications exist for both valley fill and colluvium ground water. Valley fill well B303089, located in the southeast buffer zone, was dry for 2 quarters of 1989, but a sample collected in October shows greatly elevated Na+K and SO<sub>4</sub> relative to the other valley fill wells. This anomaly is demonstrated clearly in the Stiff diagrams plotted on Plate 2. With the exception of well B303089, valley fill Stiff diagrams are similar in shape and magnitude for both the north and south buffer zone. Both the pH and the cation-anion balance for well B303089 are reasonable (7.9 and -0.4% difference, respectively), indicating that the anomalous data point does not result from gross analytical or sampling error, and suggests that valley fill ground water at that location may be influenced by a locally occurring Na or K and SO<sub>4</sub> source. Colluvial well B201289 also plots as an anomaly on both the trilinear and Stiff diagrams by containing elevated sulfate with respect to the other colluvial wells. Well B201289 may also be influenced by the dissolution of a locally occurring sulfate source. However, in general, the colluvial wells have elevated TDS (Table 5-8) and elevated Na+K concentrations relative to the other upper flow system ground water subgroups.

Well B204189 is completed in unweathered sandstone and, although it exhibits similar major ion chemistry to the other unweathered sandstone wells in the Stiff plots, it also has pH values ranging from 9.1 to 10.4 in 1989 (Appendix A). The pH values decrease over time from second quarter to fourth quarter,

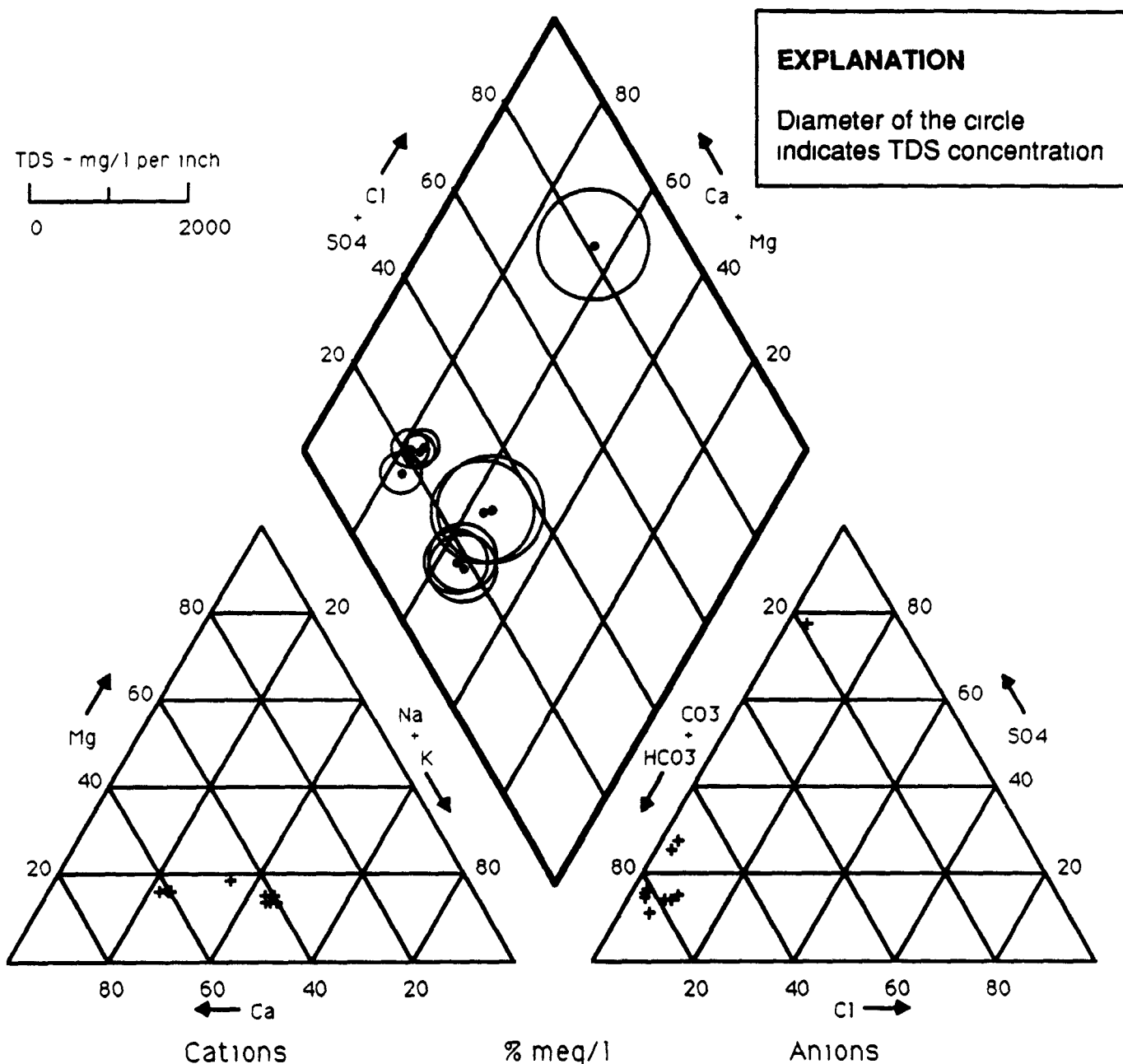
**FIGURE 5-1**  
**TRILINEAR DIAGRAM FOR ROCKY FLATS ALLUVIUM GROUND WATER 1989**



**FIGURE 5-2**  
**TRILINEAR DIAGRAM FOR VALLEY FILL ALLUVIUM GROUND**  
**WATER 1989**

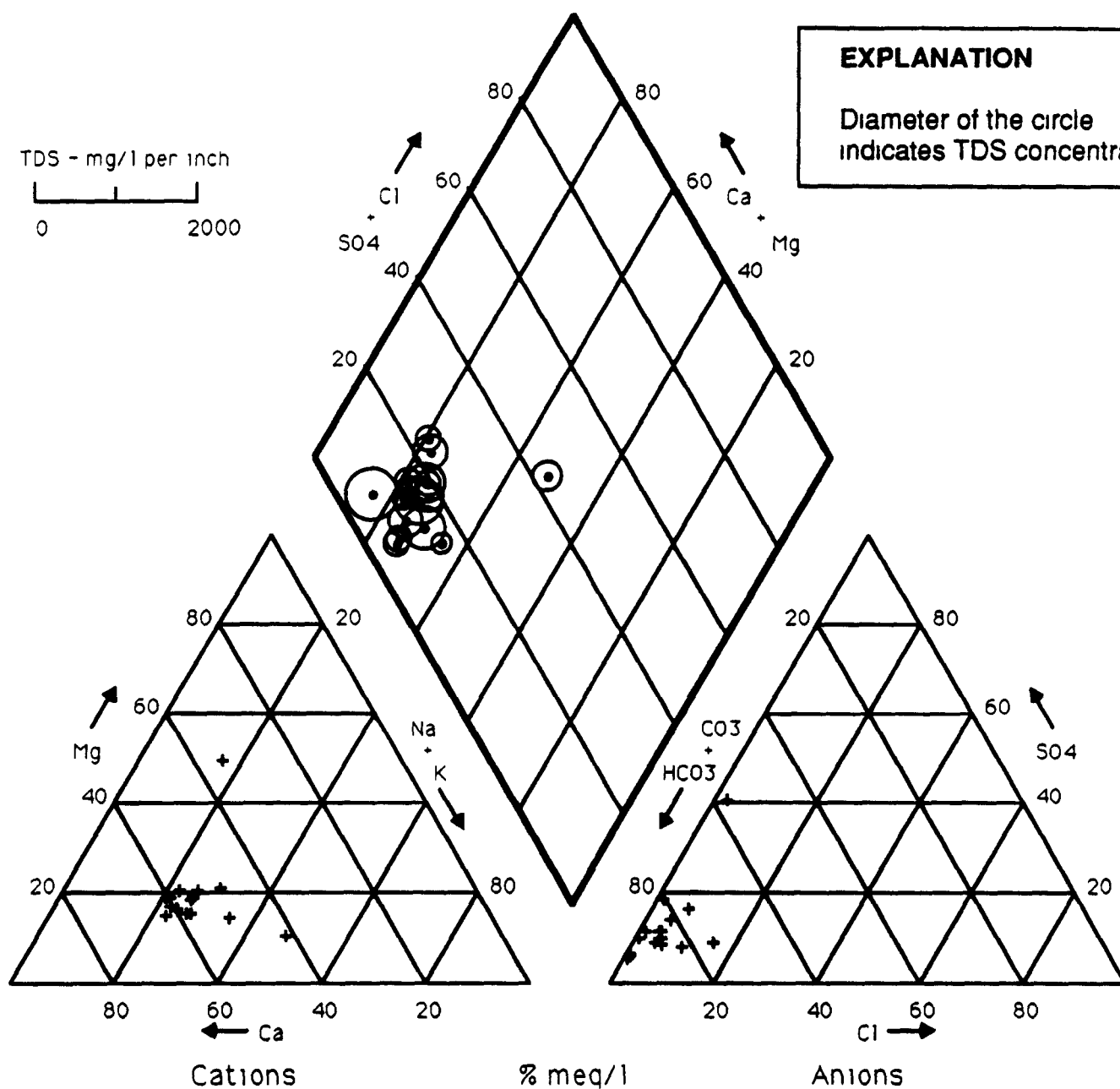


**FIGURE 5-3**  
**TRILINEAR DIAGRAM FOR COLLUVIUM GROUND WATER 1989**

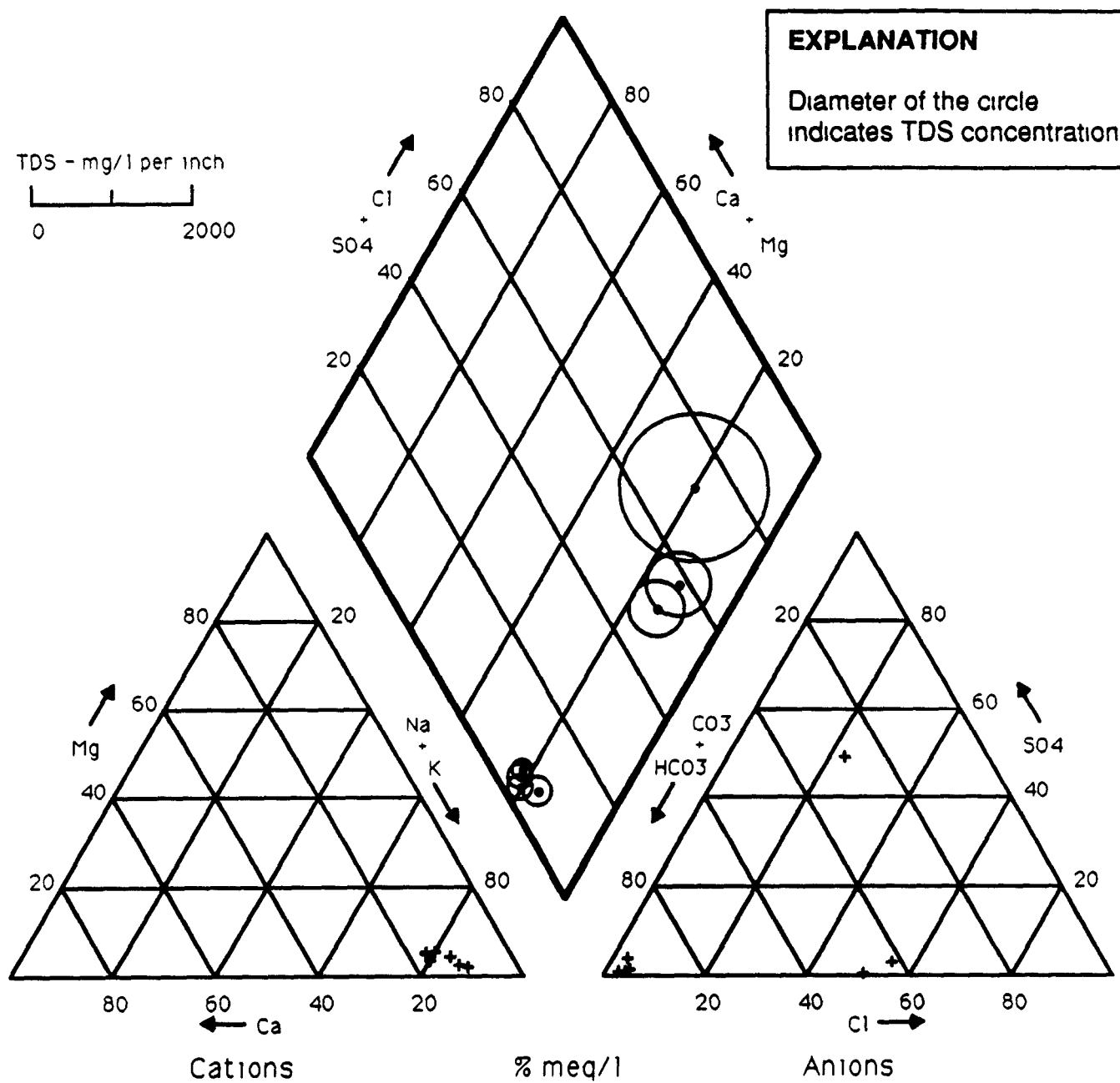


TDS - mg/l per inch

0 2000



**FIGURE 5-5**  
**TRILINEAR DIAGRAM FOR UNWEATHERED SANDSTONE**  
**GROUND WATER 1989**



suggesting that the initial high pH value may be attributed to incomplete well development after installation, and that the well is approaching a pH which is more representative of the ground water over time. Well B204189 will be monitored closely for elevated pH values in the future.

Inspection of the trilinear diagrams, Stiff diagrams (Plate 3), and Table 5-8 indicates that weathered claystone and weathered sandstone ground water can be classified similarly to the alluvial ground water subgroups, suggesting that ground water in these units is part of the same flow system. All samples collected from unweathered sandstone, however, plot in the Na or K hydrochemical facies field, and nearly half of the samples also contain elevated sulfate and chloride relative to the other subgroups. These data suggest that unweathered sandstone ground water has geochemical characteristics distinguishable from the alluvial and weathered bedrock system.

Figures 5-6 through 5-9 illustrate some changes in major ion geochemistry with downgradient distance for some of the ground water subgroups in the north and south buffer zone. The potentiometric flow map for the upper flow system (i.e., Rocky Flats Alluvium, colluvium, valley fill, weathered bedrock ground water) (Figure 3-2, first quarter, 1990) shows that although most wells within a subgroup do not line up directly along a streamline, they are generally downgradient from each other and can be used to infer water quality changes over distance. The plots indicate that water quality is not changing significantly over distance within the background well population. Major ions increase in concentration within valley fill ground water in both the North and South Rocky Flats (Figure 5-6), reflecting interaction of ground water with the aquifer materials along the flowpath. Rocky Flats Alluvium ground water also shows increasing concentration of calcium and sulfate with distance in the North Rocky Flats (Figure 5-7), yet both sodium and chloride vary only slightly along the flowpath. Valley fill wells in the South Rocky Flats similarly show increasing major ions with distance downgradient for all major ions plotted (Figure 5-8). The first well in Figure 5-8 (B402689) is not directly upgradient of the other three wells plotted (Figure 3-2 and Plate 1), which may explain the apparent drop in sodium and chloride concentrations between well B402689 and B302789. Figure 5-9 shows the changes in major ion chemistry for weathered claystone in north buffer zone, and does not reveal a strong

FIGURE 5-6  
PLOT SHOWING CHANGE IN CONCENTRATION WITH DISTANCE DOWNGRADIENT FOR VALLEY FILL IN  
THE NORTH BUFFER ZONE

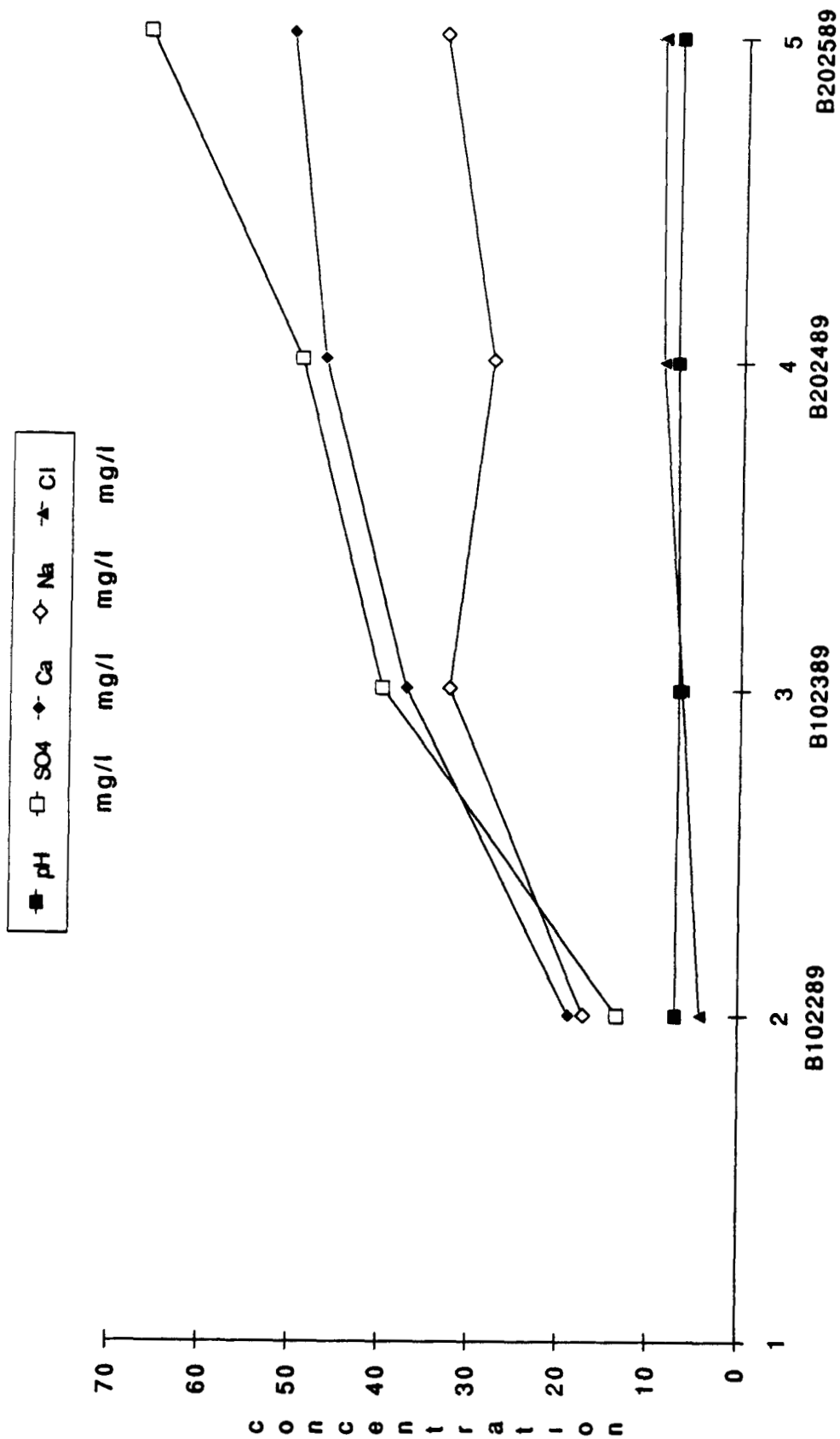


FIGURE 5-7  
 PLOT SHOWING CHANGE IN CONCENTRATION WITH DISTANCE DOWNGRADIENT FOR ROCKY FLATS ALLUVIUM  
 WELLS IN THE NORTH BUFFER ZONE

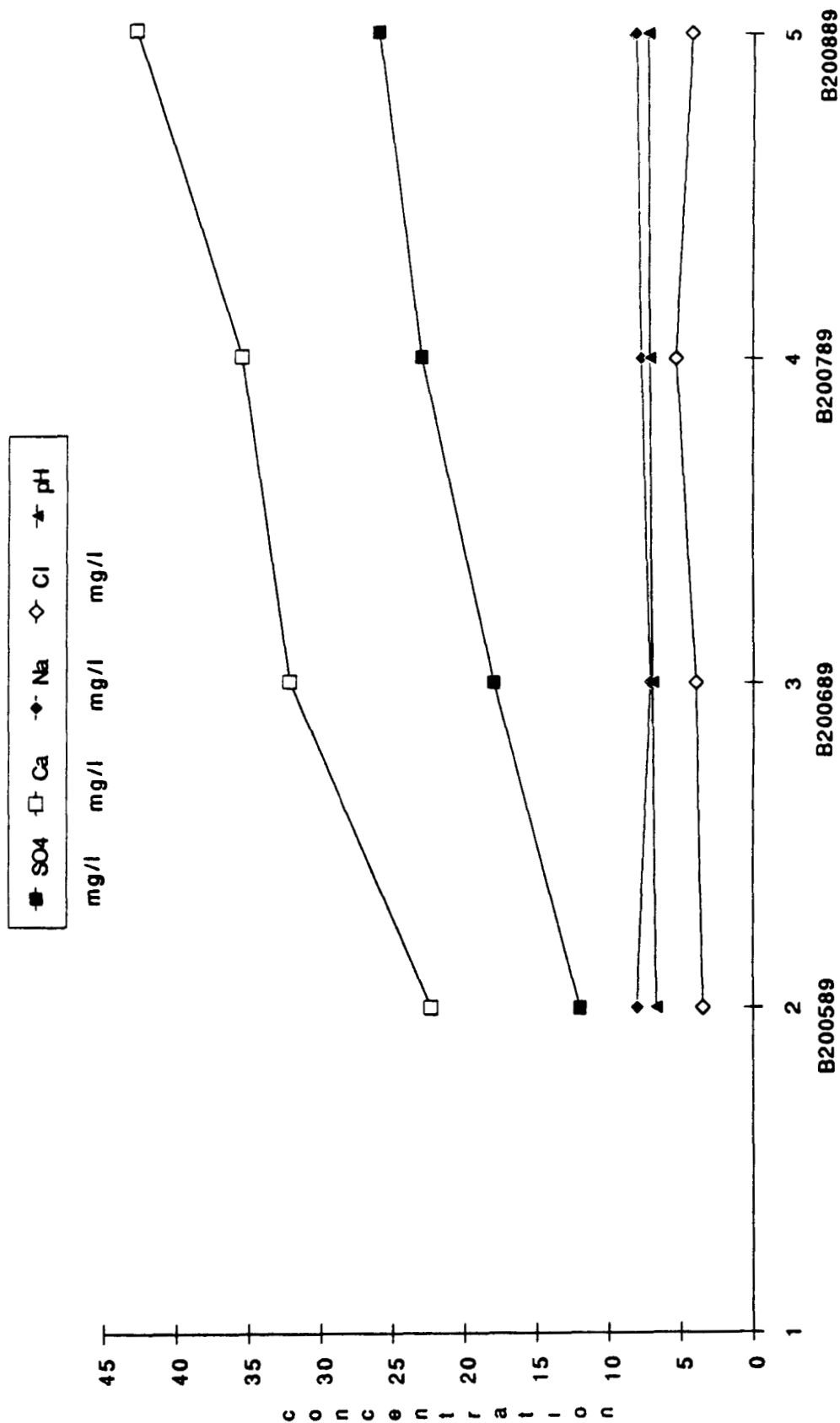


FIGURE 5-8  
 PLOT SHOWING CHANGES IN CONCENTRATION WITH DISTANCE DOWNGRADIENT FOR VALLEY FILL IN THE SOUTH  
 BUFFER ZONE

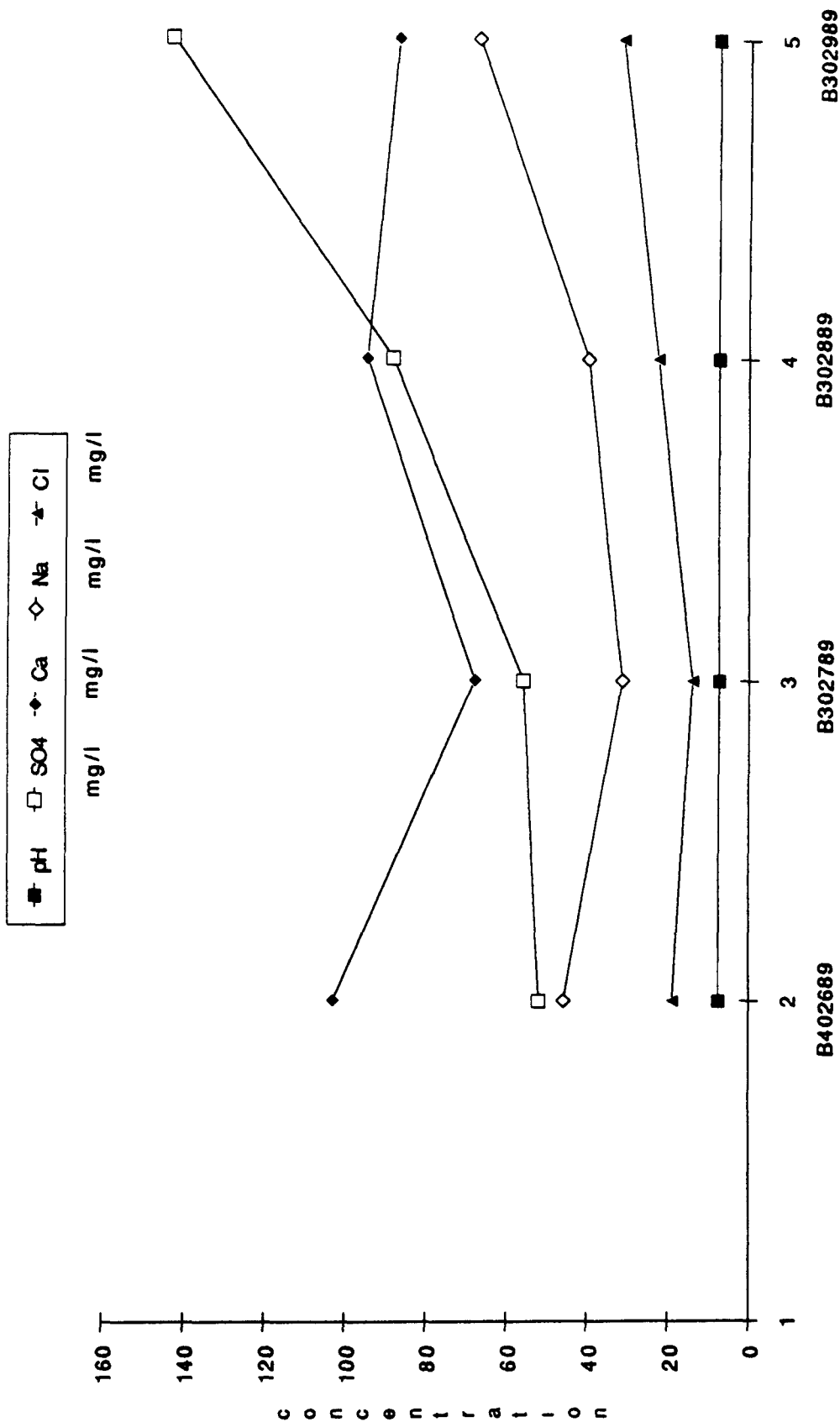
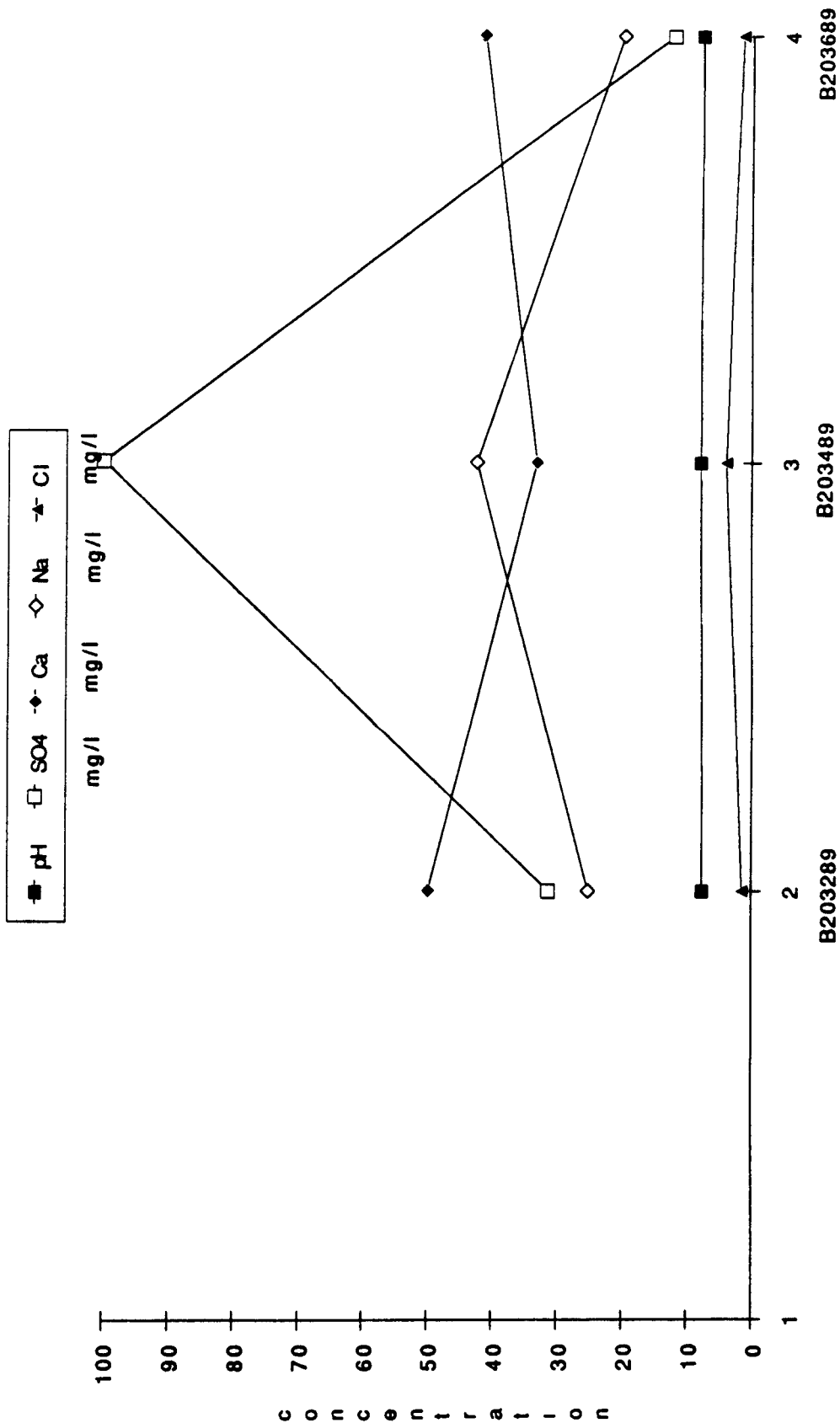


FIGURE 5-9  
 PLOT SHOWING CHANGES IN CONCENTRATION WITH DISTANCE DOWNGRADIENT FOR WEATHERED CLAYSTONE IN  
 THE NORTH BUFFER ZONE



trend although sulfate concentrations in well B203489 are much greater than in the other two wells. For all the groups plotted, pH is nearly constant.

Borehole logs and seismic data collected for the phase I geological characterization of Rocky Flats suggest that ground water at Rocky Flats can also be modeled as a dual flow system. This model consists of a lower flow system primarily within unweathered sandstones, and an upper system that flows within the unconsolidated surficial materials and weathered sandstone and claystone. (Results of the phase I geologic characterization will be complete in spring, 1991, and the phase II characterization studies will be completed in late 1991). Major ion geochemistry (discussed earlier) lends support for the dual flow system model by indicating that only unweathered sandstone ground water varies significantly and consistently from the other ground water subgroups. Therefore, tolerance intervals and descriptive statistics for analytes in ground water are computed for an upper flow system and a lower flow system in addition to the set of tolerance intervals reported for each well completion lithology.

There are several additional reasons for interpreting the ground water data both as upper versus lower aquifers and as distinct formation waters. First, the hydrogeology of the site should be considered together with the geochemistry of the ground water, recognizing that characterization work is ongoing and the underlying geologic model may change. Second, this background report presents only three quarters of ground water data, and the statistical results are likely to change in future years. Third, the interaction of surface water and ground water is not yet clearly understood at the site, and may be better explained by defining an upper flow system which is strongly influenced by surface water. For these reasons it is appropriate to present both sets of tolerance intervals in this report.

### 5.2.3 Tolerance Intervals

One tolerance interval, percent detects, or maximum value is calculated for ground water samples from each lithological unit per analyte. Chloride has separate tolerance intervals and descriptive statistics for each lithologic unit for both North and South Rocky Flats. Statistical summary tables showing tolerance

intervals, percent detects, or maximum values per analyte per grouping are presented in Tables 5-10 through 5-38 and Appendix B. Tables 5-39 through 5-48 present tolerance intervals, percent detects, or maximum values per analyte for the uppermost and the lowermost flow system. These results should be used in future monitoring programs to compare sampling results from downgradient wells with either a tolerance interval, percent detects, or a maximum value.

### 5.3 SURFACE WATER

#### 5.3.1 Statistics

Surface water stations were sampled for nine rounds in 1989, and results were tested for significant differences in surface water geochemistry between North and South Rocky Flats. Review of the total metals and total radionuclides suggests a strong correlation exists between total suspended solids and metals and radionuclides at two of the surface water stations (discussed below in Section 5.3.2). Both stations (SW080 and SW104) are located in the south buffer zone. Because of the possibility that sampling technique at these seep stations may have resulted in high suspended solids and correspondingly high total metals and radionuclides, both groups of analytes were removed from the statistical analyses. Dissolved metals, dissolved radionuclides, and inorganic data are included in the statistical analyses.

Surface water analytes with over 50% detectable concentrations include Ca, Mg, Mn, Na, Am241, Cs137, gross alpha, gross beta, Pu239, Sr89/90, U235, U238, Cl, HCO<sub>3</sub>, NO<sub>3</sub>/NO<sub>2</sub>, SO<sub>4</sub>, and pH. Analytes with less than 50% detects but more than 10% detects are Al, Pb, Fe, Li, Hg, Sr, and Zn. The following elements have less than 10% detection: Sb, As, Ba, Be, Cd, Cs, Cr, Co, Cu, Mo, Ni, K, Se, Ag, Tl, Sn, and V.

The distributions of analytes with over 50% detectable concentrations are examined for normality or lognormality. Sr89/90 is normally distributed, while all other analytes do not have a distinct normal or

lognormal distribution Ca, Mg, Mn, Na, Cl, HCO<sub>3</sub>, NO<sub>3</sub>/NO<sub>2</sub>, SO<sub>4</sub> more closely resemble a lognormal distribution, while the radionuclides and pH resemble a normal distribution

The null hypothesis tested is homogeneity of variances between North and South Rocky Flats Ca, U235, U238, Cl, and SO<sub>4</sub> are statistically different between the two areas, but since they do not have a distinct distribution, the test may have detected anormality instead of heterogeneity of variances All other analytes appear to have homogeneity of variances between North and South Rocky Flats As a result of these tests, Multivariate Analysis of Variance is not performed due to an inadequate number of analytes meeting the assumptions of normality, homogeneity of variances, and independence

Nonparametric and parametric ANOVA's are performed for analytes with more than 50% detectable concentrations The null hypothesis tested is one of no geochemical difference between North and South Rocky Flats A parametric ANOVA is performed for Sr89/90 because of its normal distribution All other analytes in this grouping do not meet one or more of the assumptions for a parametric ANOVA, so nonparametric ANOVAs are performed Test results indicate that there is a statistically significant difference in surface water geochemistry between North and South Rocky Flats for only Ca, Na, and pH Surface water geochemistry for North and South Rocky Flats is statistically similar for all other analytes tested

As per Figure 2-1, analytes with less than 50% detects but more than 10% detects are analyzed using Fisher's Exact test, or a Chi-square test adjusted for continuity The null hypothesis being tested is that the proportion of nondetects in North Rocky Flats is equal to the proportion of nondetects in South Rocky Flats The proportion of nondetects in North Rocky Flats is statistically different for only one element, Li, than the proportion of nondetects in South Rocky Flats The proportion of nondetects between North and South Rocky Flats for all other analytes tested is similar

Table 5-4 summarizes the statistical techniques, distributions, and results of the analyses for all analytes with more than 10% detects A probability value for tests between locations is provided for reference Statistical differences between North and South Rocky Flats occur for Ca, Na, and Li, all other

analytes are statistically similar between North and South Rocky Flats. Consequently, one set of tolerance intervals is calculated for all surface water analytes except Ca, Na, and Li, both North and South Rocky Flats tolerance intervals are reported for these three chemicals.

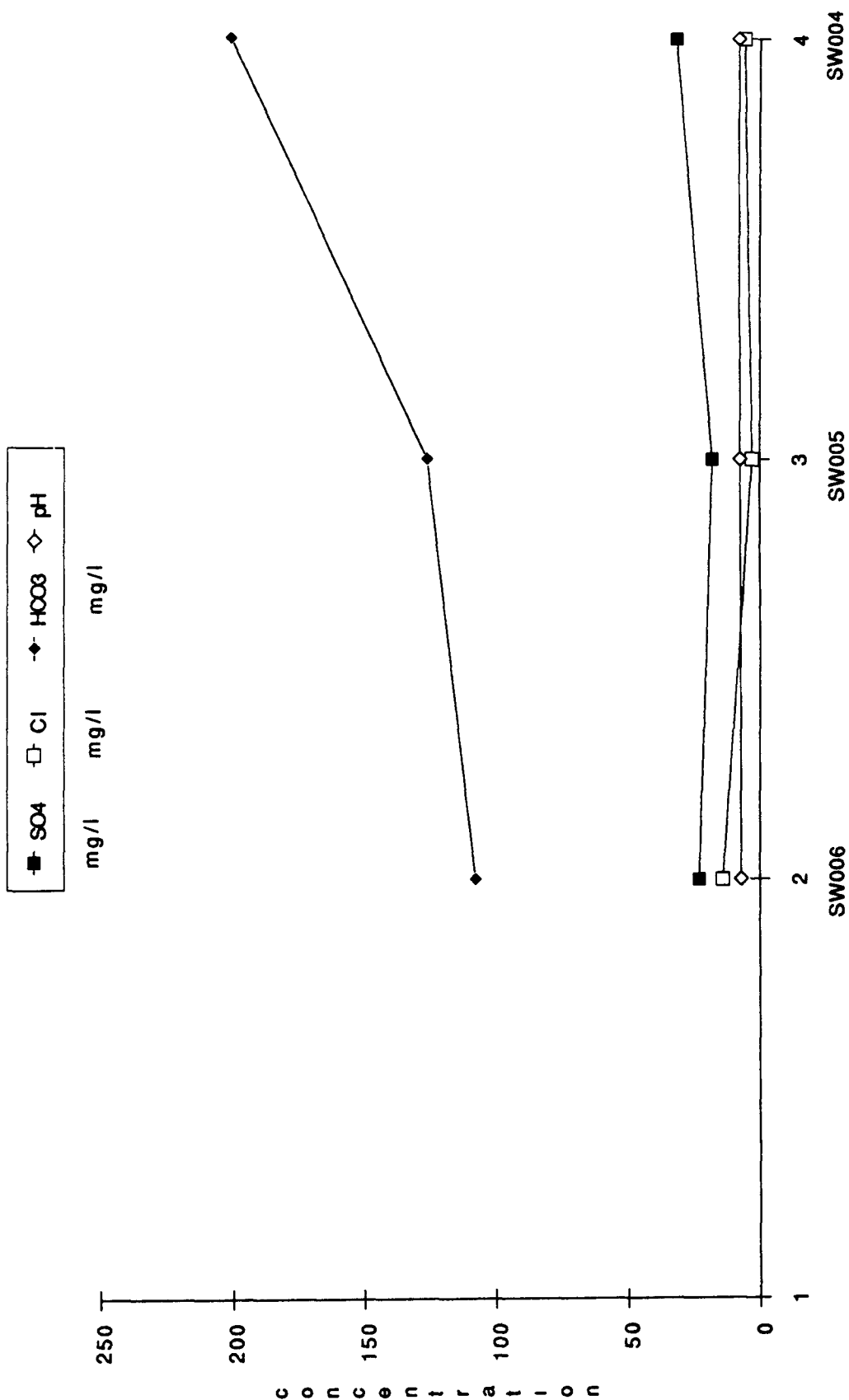
### 5.3.2 Major Ion Geochemistry

Surface water sampling sites were selected within the Rock Creek, upper Walnut Creek and Woman Creek drainages. Stiff diagrams representing mean values for major ions are presented on Plate 3 to show relative differences in water quality between sites. The Stiff diagrams show similar shapes and sizes indicating relatively low TDS calcium bicarbonate water for all stations located in stream channels (SW004, SW005, SW006, SW007, SW107, SW041) and for station 104 located at a surface seep. Stations SW106 and SW107 contain slightly elevated Na+K relative to the other stations in the North Rocky Flats. Both stations are located at the headwaters of tributaries to Rock Creek and Walnut Creek, and may be reflecting low flow combined with greater evaporative losses relative to downstream stations. Figures 5-10 and 5-11 show increasing concentrations of predominately Ca, Mg, and  $\text{HCO}_3$  with distance downstream in Rock Creek, and no significant change in K, Cl, or  $\text{SO}_4$ , although Na concentrations vary between the three stations.

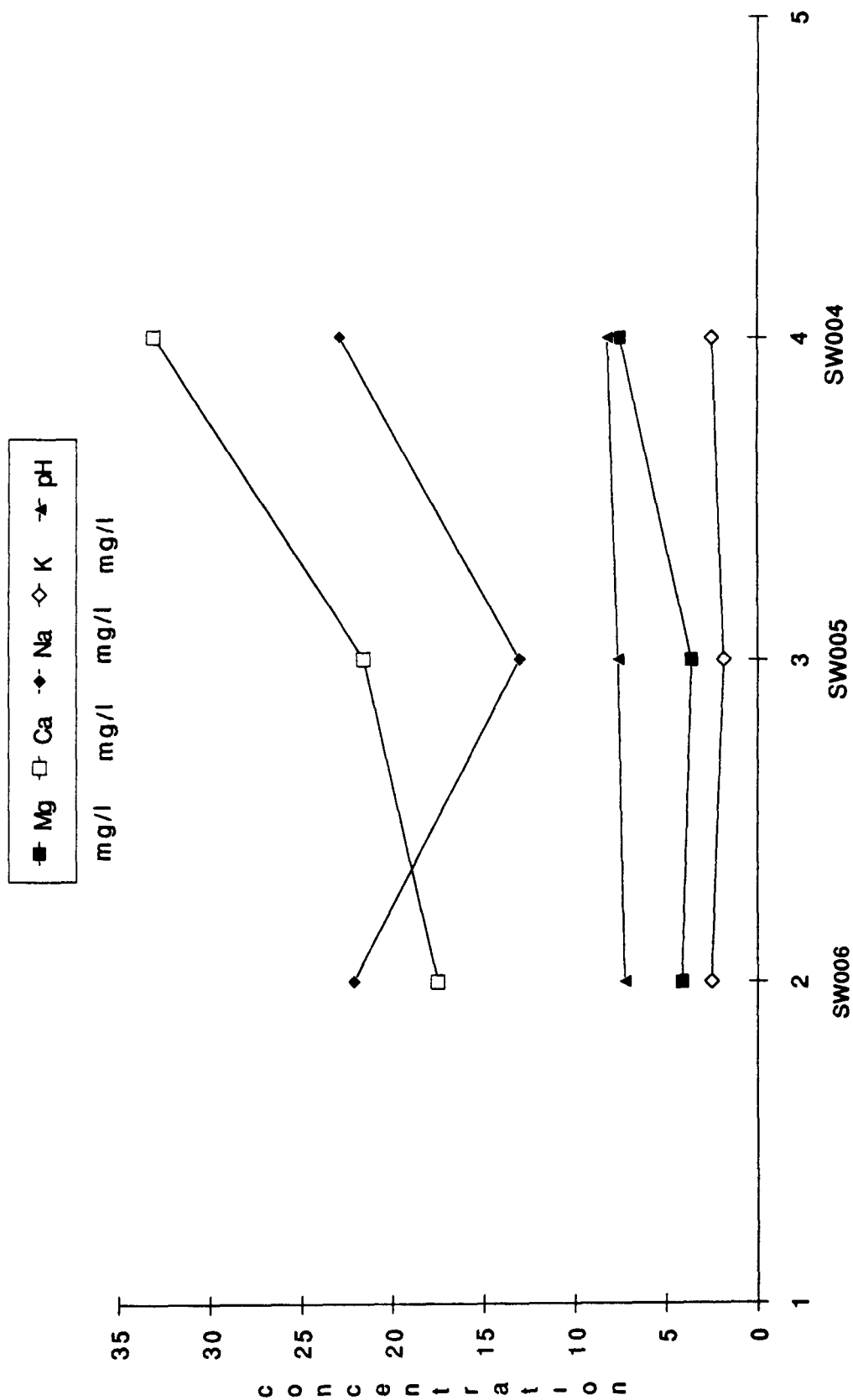
A trilinear diagram (Figure 5-12) with all 1989 surface water data shows that, like ground water, most of the samples can be classified as bicarbonate to calcium bicarbonate waters. Outliers to this classification include SW107, which contains elevated Na+K and Cl for reasons discussed above, and SW108 which has elevated  $\text{SO}_4$  values relative to all other stations. Station SW108 is located at a small pond formed by seep flow from the south hillside of Rock Creek. The seep flow probably reflects emerging colluvium ground water that contains elevated  $\text{SO}_4$  concentrations relative to the Rocky Flats Alluvium and valley fill ground water for the North Rocky Flats.

Downstream surface water Stiff diagrams resemble adjacent ground water Stiff diagrams for the upper flow system. In addition to dissolution of minerals in the stream beds, increasing major ion concentrations

FIGURE 5-10  
CONCENTRATION VS DISTANCE FOR MAJOR ANIONS FOR SURFACE WATER IN ROCK CREEK

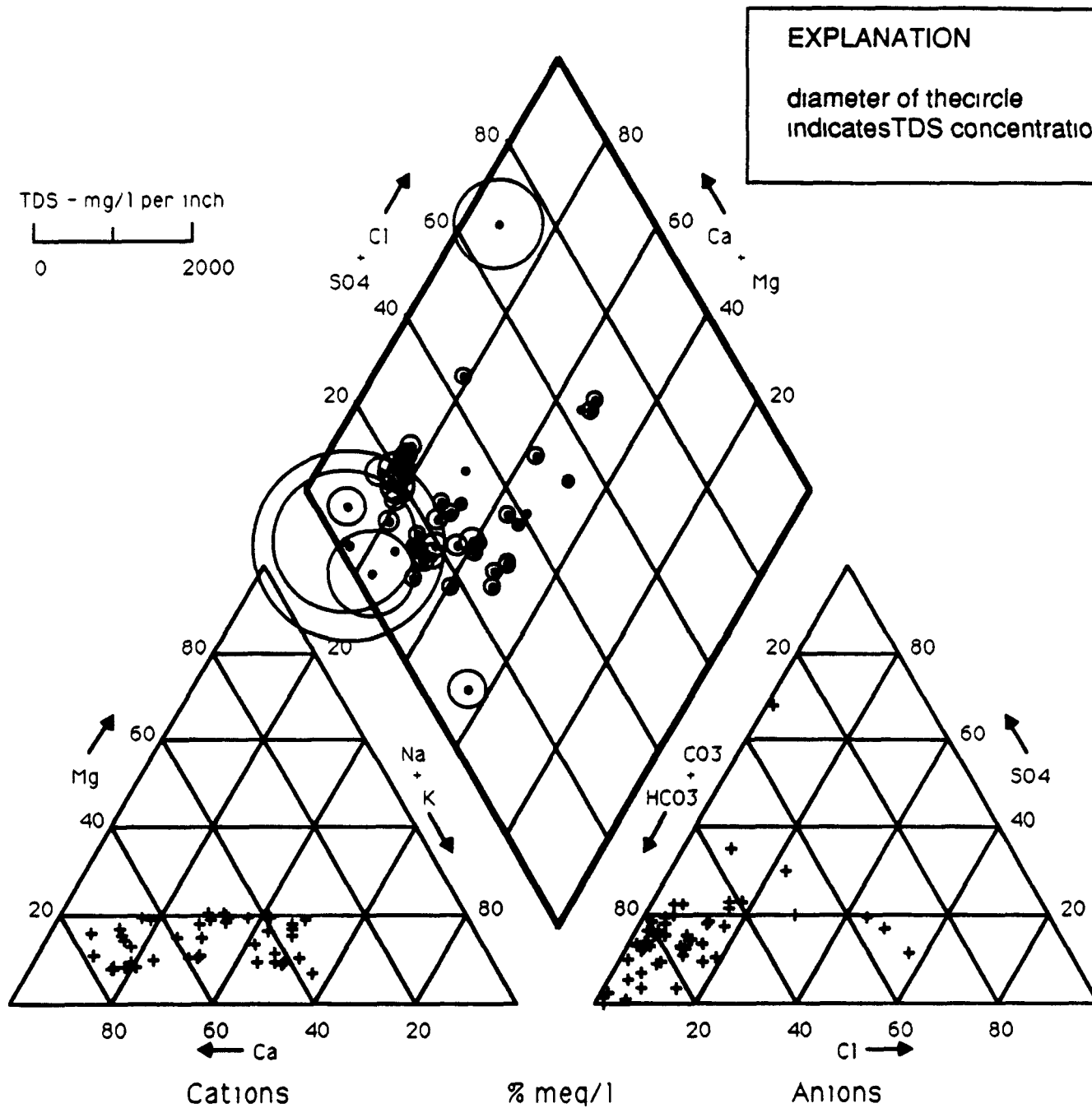


**FIGURE 5-11**  
**CONCENTRATION VS DISTANCE FOR MAJOR CATIONS IN SURFACE WATER IN ROCK CREEK**



TDS - mg/l per inch

0 2000



in surface water from west to east across the Rocky Flats Plant may reflect the stronger influence of ground water geochemistry as baseflow. Surface water stations at the western edge of the Plant are near the headwaters for Rock, Woman, and Walnut Creeks, and primarily receive runoff. Surface water stations further east are located within incised drainages with commonly visible seeps indicating ground water-surface water interaction. Three surface water stations are located at or near seeps, SW080, SW104, and SW108, and mean TDS values for these stations are significantly elevated relative to the other stations located within drainage channels (Table 5-9). The Stiff diagram plotted for SW080 on Plate 2 indicates significantly higher  $\text{HCO}_3 + \text{CO}_3$  relative to all other stations. Both  $\text{HCO}_3$  and  $\text{CO}_3$  are measured by alkalinity titration. Inspection of Table 5-29 shows that samples collected from SW080 throughout 1989 show an extreme variation in TSS concentration, which correlates well with  $\text{HCO}_3$  values for that station.

Sample collection techniques in 1989 apparently disturbed the very fine, organic-rich bottom sediment observed at station SW080. It is possible that solid calcium carbonate, organic material, silica, or some other suspended material may have produced the anomalously high  $\text{HCO}_3$  value generated by alkalinity titration, since these additional species are not reported with the other analyses. Figure 5-13 shows the correlation between TSS and  $\text{HCO}_3$  as well as selected metals. These are discussed further below.

### 5.3.3 Surface Water Geochemistry

Appendix A tabulates analytical results for dissolved and total metals, inorganics, field parameters, total radiochemicals, and dissolved (filtered in the field through a 0.45 micron filter) radiochemicals. Samples were collected for dissolved radiochemicals for one round to compare with totals. Unfiltered samples were subsequently collected because total concentrations are relevant to risk assessments, and radionuclide standards are established for total, not dissolved concentrations.

The summary tables indicate that total metal concentrations differ significantly from dissolved metal concentrations for several major and trace metals. Similarly, total radiochemical values differ from dissolved values reported for one round. Much of the difference between total and dissolved analyses may be

explained by the relationship between total suspended solids (TSS) and total metal and total radiochemical concentrations. Table 5-9 compares TDS values with TSS values for stations located in stream channels and stations at or near seeps. The table indicates that TDS values for SW080, SW104 and SW108 are similar to TDS values for stations located in stream channels, although SW104 is consistently higher than all the other stations. TSS values for the stream channel stations, however, show little difference between sampling events compared to the seep stations, which show extreme variability, and much higher maximum concentrations particularly for SW104 and SW080. Stations SW080 and SW104 also have consistently higher total metal and radionuclide concentrations than the other stations.

Figures 5-13 through 5-16 show TSS values plotted with a subset of total metal and total radionuclide values for 1989 sampling events at stations SW080 and SW104. The plots show a strong correlation between TSS and metals/radionuclides, suggesting that the bulk of the chemical load is suspended material at these sites. The dissolved metal and radiochemical data presented in Appendix A for these stations suggest that the dissolved chemicals do not significantly differ from the other surface water stations. Sites SW080 and SW104 are seeps with abundant grass and cattails, and have bottom sediments comprised of very fine, easily disturbed, organic-rich muds. Sampling practices in 1989 could easily have stirred up the sediments during low flow episodes, resulting in erratic TSS values and correspondingly erratic total metals and radionuclide values. EG&G is currently exploring the potential for installing modified spring boxes at seep stations with easily disturbed bottom sediment to ensure more accurate sampling of the seep water.

Two rounds of radionuclide and total metals data for sediments shows that radionuclide concentrations in SW080 and SW104 are nearly indistinguishable from the other background sediment sites. Station SW104 has higher concentrations of magnesium, nickel, and vanadium, SW080 is elevated in barium, and strontium, and both stations are higher in aluminum, calcium, and lead than the other sites. The organic and clay-rich bottom sediments of these stations may preferentially adsorb some of these trace metals, whereas the coarser sand and gravel bottoms of stations located in stream channels may not adsorb trace metals as readily. EG&G is collecting additional rounds of sediment samples at these sites in 1990 to compare with the two rounds collected in 1989.

FIGURE 5-13 PLOT COMPARING TSS WITH TOTAL METALS AT SW080

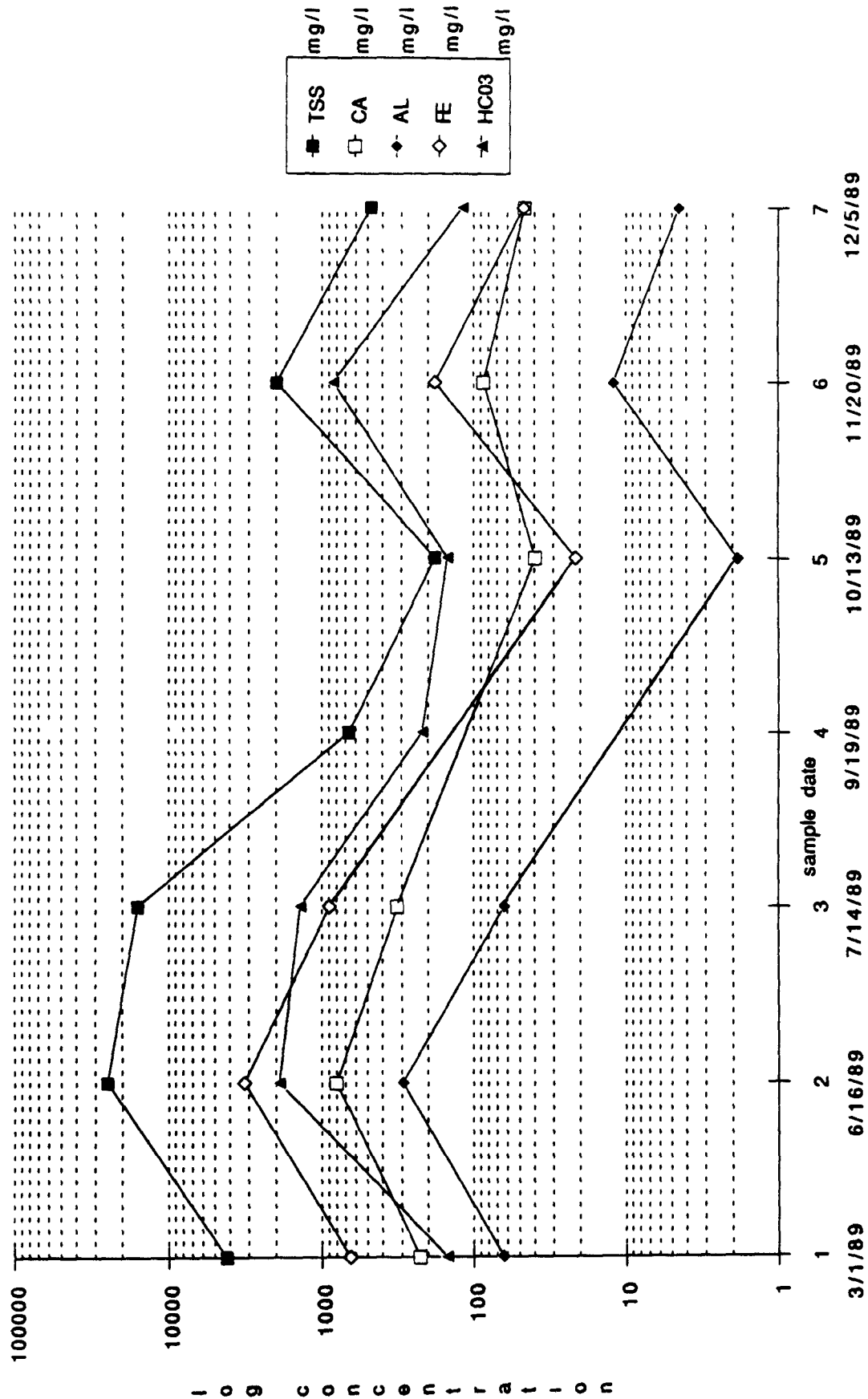


FIGURE 5-14 PLOT COMPARING TSS WITH TOTAL METALS AT SW104

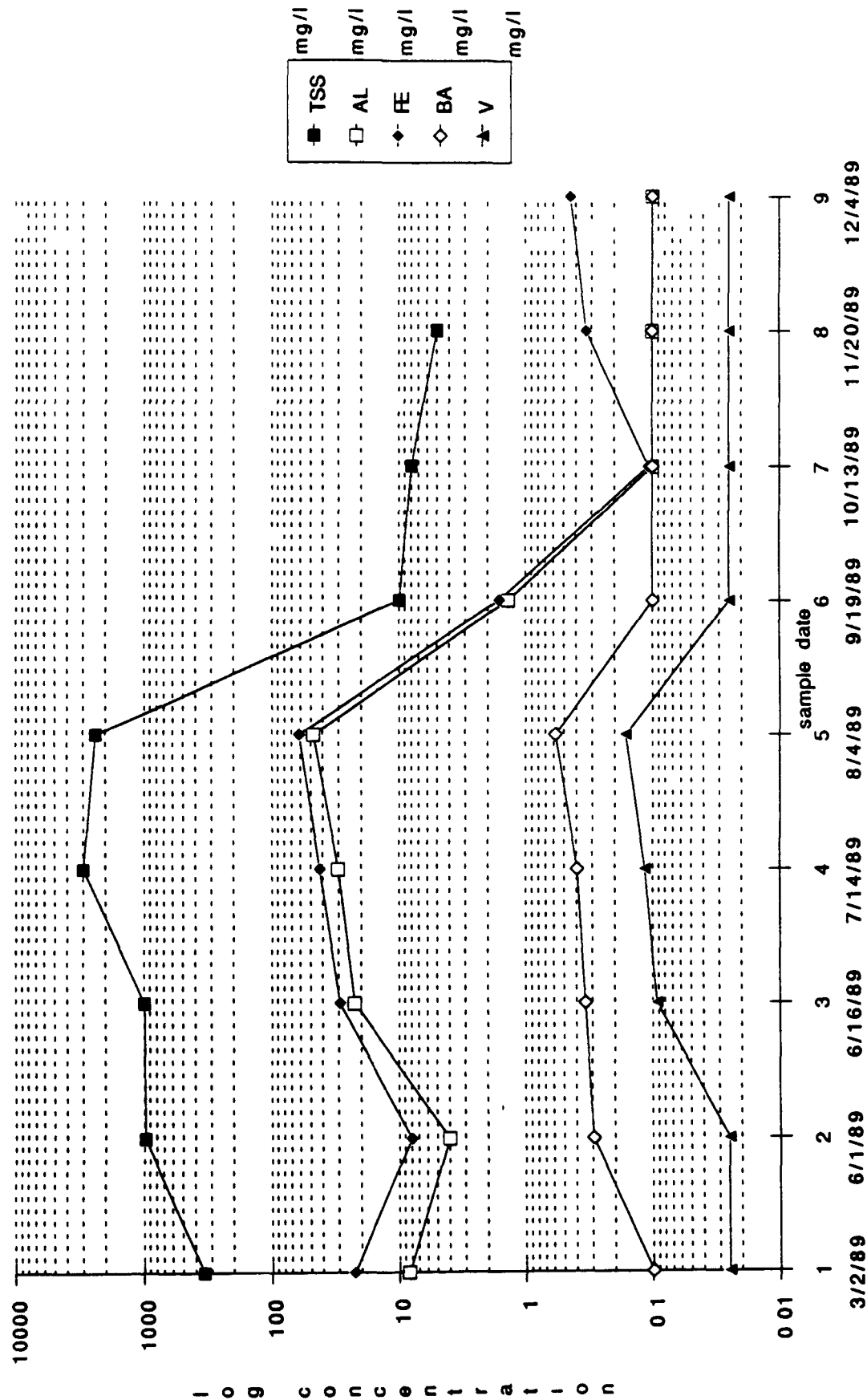


FIGURE 5-15 PLOT COMPARING TSS WITH TOTAL RADIONUCLIDES AT SW080

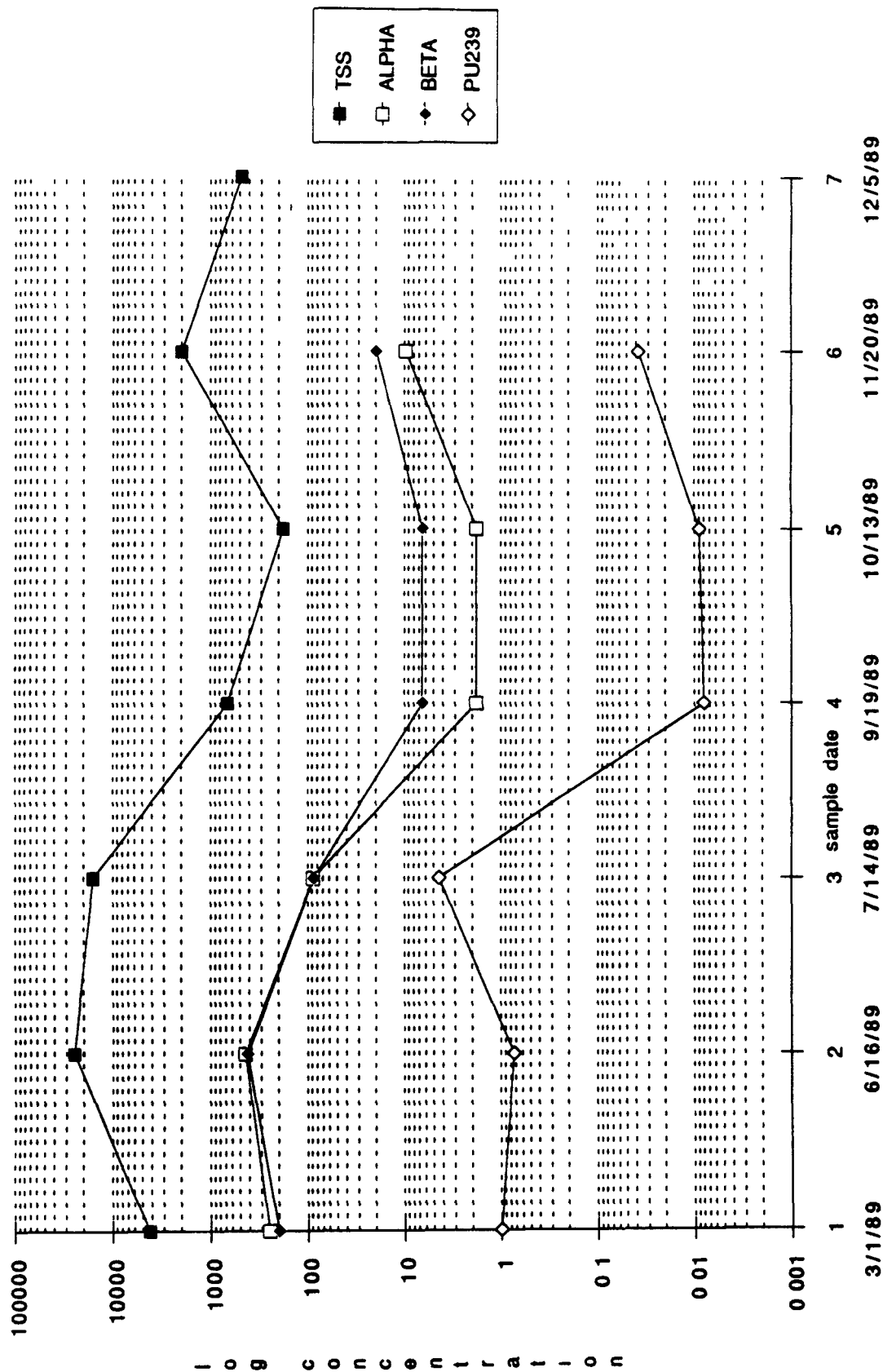
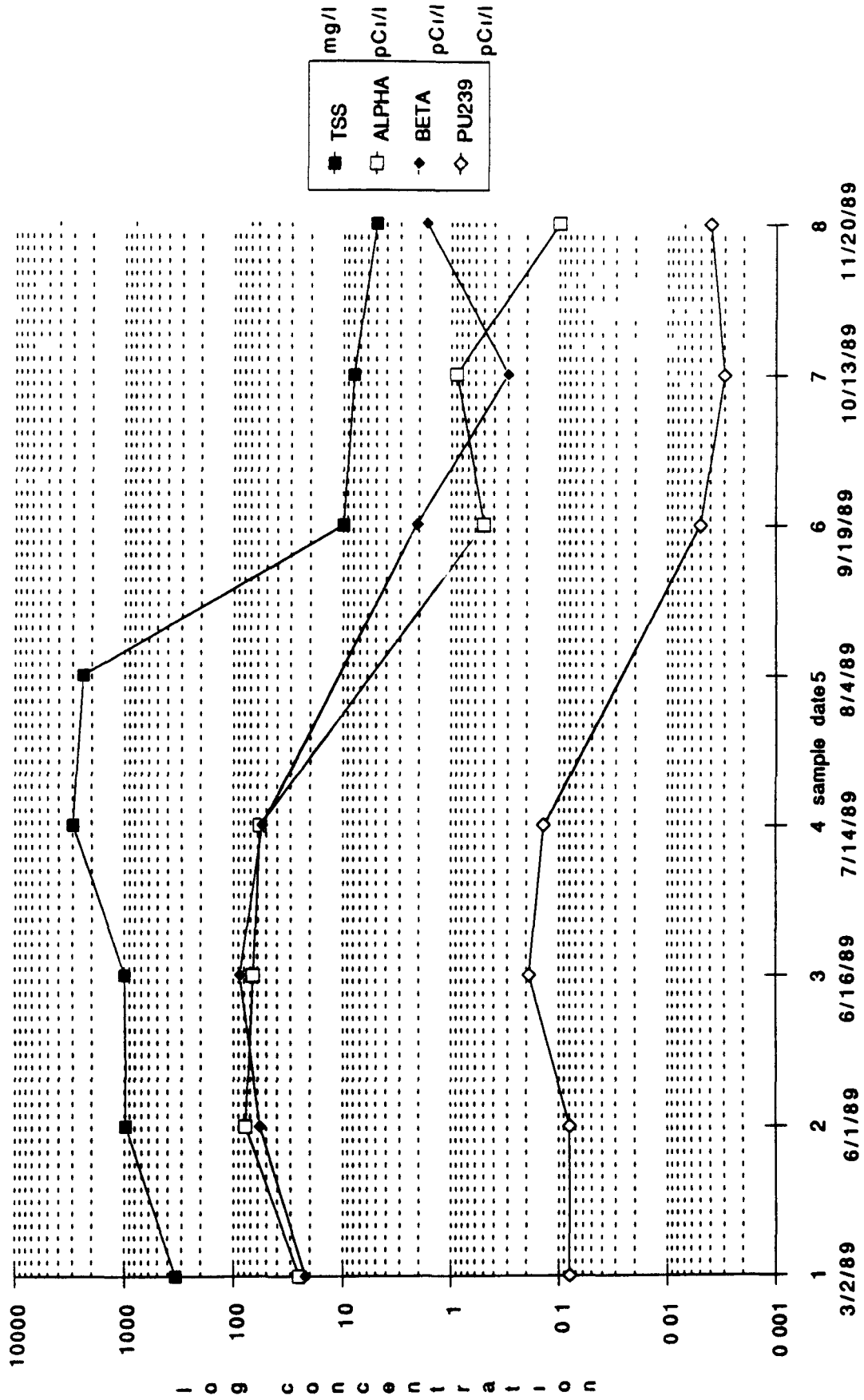


FIGURE 5-16 PLOT COMPARING TSS WITH TOTAL RADIONUCLIDES AT SW104



Surface water flow at RFP varies seasonally, resulting in dry background stations during several sampling events in 1989. Seasonality of surface water geochemistry is currently being explored as data from background sites are received. Firm conclusions regarding seasonal variation will not be reported until at least two more years of data are available for statistical analysis. Consequently, tolerance intervals for 1989 surface water data were calculated without considering seasonality.

#### 5.3.4 Tolerance Intervals

One tolerance interval, percent detects, or maximum value is reported for surface water for each analyte, except for Ca, Na, and Li. Separate tolerance intervals, percent detects, or maximum values are reported for North Rocky Flats and South Rocky Flats for Ca, Na, and Li. Statistical Summary tables showing tolerance intervals, percent detects, or maximum values per analyte by grouping are presented in Tables 5-49 through 5-56 and Appendix B. Tolerance intervals, percent detects, and maximum values are reported for total metals, dissolved metals, total radionuclides, dissolved radionuclides, and inorganics. These results should be used in future monitoring programs to compare sampling results from downgradient surface water stations with either a tolerance interval, percent detects, or a maximum value.

### 5.4 SEDIMENTS

#### 5.4.1 Statistics

Sediments were sampled twice in 1989, and, like surface water, the analytical results were tested for significant differences between North and South Rocky Flats locations.

Analytes with more than 50% detectable concentrations include Al, Cr, Fe, Pb, Mn, V, Zn, pH, Am-241, Cs-137, gross alpha, gross beta, Pu-239, Ra-226, Ra-228, Sr-89/90, tritium, U-233/234, U-235, and U-238. Analytes with less than 50% detectable concentrations but more than 10% detects include As, Ba, Ca, Cu,

Mg, Ni, and  $\text{NO}_3/\text{NO}_2$ . The following elements each have three or fewer detectable concentrations: Sb, Be, Cd, Cs, Co, Li, Hg, Mo, K, Se, Ag, Na, Sr, Tl, and Sn.

The distributions of analytes with more than 50% detectable concentrations are examined for normality or lognormality. Am241, Cs137, Pu239, and U235 do not have distinct normal or lognormal distributions. Al, Cr, Pb, V, U238, and Ra228 appear to be lognormally distributed, while the other analytes are normally distributed.

All analytes with more than 50% detectable concentrations are examined for homogeneity of variances. The null hypothesis is that variances from North and South Rocky Flats are homogeneous. All analytes, except Al, Pb, and U235, satisfy the assumption for MANOVA and ANOVA of homogeneity of variances between North and South Rocky Flats.

Because many of the statistical assumptions are satisfied, MANOVA is performed using analytes with more than 50% detectable concentrations to test the null hypothesis of no overall difference in geochemistry between North and South Rocky Flats. Prior to computing the MANOVA, gross alpha, gross beta, Am241, V, and Al were removed from the data set, because of missing data values, in order to increase the degrees of freedom. MANOVA results show no significant geochemical differences between North and South Rocky Flats ( $p\text{-value} = 0.5581$ ).

Nonparametric (Kruskal-Wallis) and parametric ANOVA's are used for gross alpha, gross beta, Am241, V, and Al since they could not be included in the MANOVA. The null hypothesis tested is one of no difference in geochemistry between North and South Rocky Flats. A nonparametric ANOVA is performed for Al and Am241, because Al does not meet the assumption of homogeneity of variances and Am241 does not meet the normality assumptions. A parametric ANOVA is calculated for gross alpha, gross beta, and V. There is no statistically significant geochemical difference between North and South Rocky Flats for each of these five analytes.

Analytes with less than 50% detectable concentrations but over 10% detects, were analyzed using Fisher's Exact Test, or a Chi-square test corrected for continuity. The null hypothesis states that the proportion of nondetects in North Rocky Flats is equal to the proportion of nondetects in South Rocky Flats. The tests show that there is no statistically significant difference in the proportion of nondetects between North and South Rocky Flats for all analytes tested.

Table 5-5 summarizes the statistical techniques, distributions, and results of the analyses for analytes in sediment samples with more than 10% detectable concentrations and more than three detected samples. A probability value from the analysis is provided for reference. Because all analytes show no statistical difference between sites, sediments have statistically similar chemistry in North and South Rocky Flats, and one tolerance interval, percent detects, or maximum value is calculated per analyte for the entire RFP.

#### 5.4.2 Tolerance Intervals

Statistical summary tables for sediments showing one tolerance interval, percent detects, or maximum value for each analyte are presented in Tables 5-57 through 5-59 and Appendix B. These results should be used in future monitoring programs to compare sampling results from downstream sediment stations with either a tolerance interval, a maximum value, or by using percent detects.

### 5.5 BOREHOLE MATERIALS

#### 5.5.1 Statistics

Borehole material samples were collected from Rocky Flats Alluvium, colluvium, weathered claystone and weathered sandstone. The chemical analyses are tested for significant differences between locations and lithological units, except for Am241, which was only analyzed in samples collected in North Rocky Flats within Rocky Flats alluvium.

Analytes with over 50% detectable concentrations include Al, As, Ba, Be, Ca, Cr, Cu, Pb, Fe, Li, Mg, Mn, Mo, Ni, V, Zn, pH, Cs137, gross alpha, gross beta, Pu239, Ra226, Ra228, Sr89/90, tritium, U233/234, U235, and U238. Analytes with less than 50% detectable concentrations but greater than 10% detects are Co, Hg, K, Ag, Sr, Sn, S and  $\text{NO}_3/\text{NO}_2$ . The following elements have less than 10% detectable results: Sb, Cd, Cs, Se, Na, and Ti.

The distributions of borehole material analytes with over 50% detectable concentrations are examined for normality or lognormality. The following analytes do not have a distinct normal or lognormal distribution: As, Ba, Be, Ca, Cu, Pb, Li, Mg, Mn, Mo, Ni, V, Zn, Ra226, Pu239, and pH. Pu239, U235, and pH may have a normal distribution, while the other analytes listed more closely resemble the lognormal distribution. Al, Cr, Fe, U233/234, and U238 are lognormally distributed and gross alpha, gross beta, Ra228, Sr89/90, and tritium are normally distributed.

The null hypothesis of homogeneous variances in North and South Rocky Flats is tested within each lithologic group for all analytes with over 50% detects. For those analytes which do not have a normal or lognormal distribution, the test may detect anormality instead of heterogeneity of variances. The results show that all radionuclides with distinct distributions, either normal or lognormal, have homogeneous variances between North and South Rocky Flats within each lithologic group. However, the variances for Al, Cr, and Fe are heterogeneous.

Multivariate Analysis of Variance is not used on boreholes materials data because an inadequate number of analytes meet the assumptions of normality, homogeneity of variances, and Independence.

Nonparametric and parametric ANOVA's are performed for analytes with more than 50% detectable concentrations. The null hypotheses tested are of no difference in borehole geochemistry between North and South Rocky Flats and no geochemical difference between each lithologic group. A parametric ANOVA is performed for gross alpha, gross beta, Ra228, Sr89/90, tritium, U233/234, and U238. All other analytes in the grouping do not meet one or more of the assumptions for a parametric ANOVA, so a nonparametric

ANOVA is performed. The results show that Ca, Cr, Cu, Pb, Li, Mo, Ni, V, and Zn have statistically significant geochemical differences between boreholes in North Rocky Flats and boreholes in South Rocky Flats. A statistically significant geochemical difference also exists among borehole lithologic groups for Al, Ba, Ca, Cr, Cu, Pb, Li, Mg, Mo, Zn, pH, gross alpha, Pu239, Ra226, Ra228, tritium, U233/234, U235, and U238. Furthermore, multiple comparison tests between lithologic groups completed for each analyte show a statistically significant chemical difference between lithologic groups. All analytes except Mg show a statistical difference between Rocky Flats Alluvium and at least one other lithologic group. In contrast, only a small number of analytes differ between the other lithologies, colluvium, weathered sandstone, and weathered claystone. For example, Mg and Li show a statistical difference between weathered sandstone and colluvium, and Cu shows a statistical difference between weathered claystone and weathered sandstone.

Analytes with less than 50% detectable concentrations but greater than 10% detects were analyzed using Fisher's Exact test and a Chi-square test. The null hypotheses tested are, (1) that the proportion of nondetects in North Rocky Flats equals the proportion of nondetects in South Rocky Flats, and (2) that the proportion of nondetects in each lithologic group, Rocky Flats alluvium, colluvium, weathered sandstone, and weathered claystone, is independent of the proportion of nondetects in the other lithologic groups. Results show that there is a statistically significant difference in the proportion of nondetects in North and South Rocky Flats for Hg, Sr, Sn, and  $\text{NO}_3/\text{NO}_2$ . Strontium also shows a statistically significant difference between lithologies; Rocky Flats Alluvium has less detectable Sr than the other lithologic groups.

Tables 5-6 through 5-7 summarize the statistical techniques, distributions, and results of the analyses for all analytes with more than 10% detectable concentrations. A probability value from tests between locations and lithologic groups is provided for reference. Since most differences in borehole lithologic groups occur between Rocky Flats Alluvium and the other lithologic groups, borehole materials in Rocky Flats Alluvium are considered statistically different from colluvium, weathered claystone, and weathered sandstone. As a result, colluvium, weathered claystone, and weathered sandstone borehole materials are considered chemically similar. Borehole materials in North and South Rocky Flats are found to be different for Ca, Cr,

Cu, Pb, Li, Mo, Ni, V, Zn, Hg, Sn, and NO<sub>3</sub>/NO<sub>2</sub> For the other analytes, borehole materials are statistically similar between North and South Rocky Flats

#### 5.5.2 Tolerance Intervals

One tolerance interval, percent detects, and maximum value is presented for each analyte for Rocky Flats Alluvium, while one set of tolerance intervals, percent detects, or maximum concentrations is presented for the combined group of colluvium, weathered sandstone, and weathered claystone. These summary statistics are also presented for both North and South Rocky Flats for the following analytes: Ca, Cu, Pb, Li, Mo, Ni, V, An, Hg, Sn, and NO<sub>3</sub>/NO<sub>2</sub>. Statistical summary tables showing tolerance intervals, percent detects, or maximum values per analyte per grouping are presented in Tables 5-60 through 5-73 and Appendix B. These results should be used in future monitoring programs to compare sampling results from non-background boreholes with either a tolerance interval, a maximum value, or percent detects.

TABLE 5-1 STATISTICAL COMPARISON CHART FOR GROUND WATER DISSOLVED METALS

| ANALYSIS TECHNIQUE<br>DISTRIBUTION | K<br>L* | K<br>L | K<br>L | K<br>L | T      | T      | T      | T      | T      | T      |
|------------------------------------|---------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| ANALYTE (Dissolved Metals)         | Ca      | Mg     | Mn     | Na     | Al     | Ba     | Fe     | Pb     | Li     | Hg     |
| PROBABILITY**                      | 0 0001  | 0 0001 | 0 0817 | 0 0001 | 0 8560 | 0 2810 | 0 7110 | 0 5680 | 0 1020 | 0 0960 |
| KCL VS KSSU***                     | X       | X      |        | X      |        |        |        |        |        |        |
| KCL VS QC                          |         |        |        | X      |        |        |        |        |        |        |
| KCL VS QRF                         |         | X      |        | X      |        |        |        |        |        |        |
| KCL VS QVF                         |         |        |        |        |        |        |        |        |        |        |
| KSSU VS QC                         | X       | X      |        |        |        |        |        |        |        |        |
| KSSU VS QRF                        | X       |        |        | X      |        |        |        |        |        |        |
| KSSU VS QVF                        | X       | X      |        | X      |        |        |        |        |        |        |
| QC VS QRF                          | X       | X      |        | X      |        |        |        |        |        |        |
| QC VS QVF                          |         |        |        | X      |        |        |        |        |        |        |
| QRF VS QVF                         |         | X      |        | X      |        |        |        |        |        |        |
| KSSW VS QC                         |         |        |        | X      |        |        |        |        |        |        |
| KSSW VS QRF                        |         |        |        | X      |        |        |        |        |        |        |
| KSSW VS KCL                        |         |        |        | X      |        |        |        |        |        |        |
| KSSW VS QVF                        |         |        |        |        |        |        |        |        |        |        |
| KSSW VS KSSU                       | X       |        |        | X      |        |        |        |        |        |        |
| NORTH VS SOUTH                     | 0 3740  | 0 9340 | 0 9660 | 0 0627 | 0 8000 | 0 7730 | 0 0940 | 0 3500 | 0 3520 | 0 1790 |

\*Lognormally distributed

\*\*The probability of obtaining a greater difference between the lithologic units than the one observed

\*\*\*Multiple comparisons are run comparing each lithologic unit against another An "X" indicates that a significant difference occurs between the two lithologies for that analyte

M = MANOVA

A = ANOVA

K = nonparametric ANOVA (Kruskal-Wallis)

T = Test of Proportions

TABLE 5-1 (Continued) STATISTICAL COMPARISON CHART FOR GROUND WATER DISSOLVED METALS

| ANALYSIS TECHNIQUE<br>DISTRIBUTION | T      | T      | T      | T      | T                   | T              | T               | T |
|------------------------------------|--------|--------|--------|--------|---------------------|----------------|-----------------|---|
| ANALYTE (Dissolved Metals)         | K      | Se     | Sr     | Zn     | Number<br>different | Number<br>same | Total<br>number |   |
| PROBABILITY**                      | 0 1930 | 0 0770 | 0 4060 | 0 1630 |                     |                |                 |   |
| KCL VS KSSU***                     |        |        |        |        | 3                   | 11             | 14              |   |
| KCL VS QC                          |        |        |        |        | 1                   | 13             | 14              |   |
| KCL VS QRF                         |        |        |        |        | 2                   | 12             | 14              |   |
| KCL VS QVF                         |        |        |        |        | 0                   | 14             | 14              |   |
| KSSU VS QC                         |        |        |        |        | 2                   | 12             | 14              |   |
| KSSU VS QRF                        |        |        |        |        | 2                   | 12             | 14              |   |
| KSSU VS QVF                        |        |        |        |        | 3                   | 11             | 14              |   |
| QC VS QRF                          |        |        |        |        | 3                   | 11             | 14              |   |
| QC VS QVF                          |        |        |        |        | 1                   | 13             | 14              |   |
| QRF VS QVF                         |        |        |        |        | 2                   | 12             | 14              |   |
| KSSW VS QC                         |        |        |        |        | 1                   | 13             | 14              |   |
| KSSW VS QRF                        |        |        |        |        | 1                   | 13             | 14              |   |
| KSSW VS KCL                        |        |        |        |        | 0                   | 14             | 14              |   |
| KSSW VS QVF                        |        |        |        |        | 0                   | 14             | 14              |   |
| KSSW VS KSSU                       |        |        |        |        | 2                   | 12             | 14              |   |
| NORTH VS SOUTH                     | 0 8860 | 0 0590 | 0 8890 | 1 0000 | 0                   | 14             | 14              |   |

\*Lognormally distributed

\*\*The probability of obtaining a greater difference between the lithologic units than the one observed

\*\*\*Multiple comparisons are run comparing each lithologic unit against another An "X" indicates that a significant difference occurs between the two lithologies for that analyte

M = MANOVA

A = ANOVA

K = nonparametric ANOVA (Kruskal-Wallis)

T = Test of Proportions

TABLE 5-2 STATISTICAL COMPARISON CHART FOR GROUND WATER DISSOLVED RADIONUCLIDES

| ANALYSIS TECHNIQUE<br>DISTRIBUTION        | K<br>N*         | A<br>N | Cs137<br>Alpha | Beta   | Pu239  | Ra226  | K<br>N | K<br>N | A<br>N | H3     | U235   | U238   | Number<br>different | Number<br>same | Total<br>number |
|---|-----------------|--------|----------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------------------|----------------|-----------------|
| ANALYTE (Dissolved Rads)<br>PROBABILITY** | Am241<br>0 0018 | 0 5585 | 0 0057         | 0 0001 | 0 7816 | 0 1588 | 0 3349 | 0 4860 | 0 0001 | 0 0001 | 0 0001 | 0 0001 |                     |                |                 |
| KCL VS KSSU***                            |                 |        |                |        |        |        |        |        |        |        |        |        | 0                   | 10             | 10              |
| KCL VS QC                                 | X               |        |                | X      |        |        |        |        | X      |        |        | X      | 4                   | 6              | 10              |
| KCL VS QRF                                |                 |        |                |        |        |        |        |        |        |        |        |        | 0                   | 10             | 10              |
| KCL VS QVF                                | X               |        |                |        |        |        |        |        |        |        |        |        | 1                   | 9              | 10              |
| KSSU VS QC                                | X               |        | X              | X      |        |        |        |        | X      |        |        | X      | 5                   | 5              | 10              |
| KSSU VS QRF                               |                 |        |                |        |        |        |        |        |        |        |        |        | 0                   | 10             | 10              |
| KSSU VS QVF                               | X               |        |                |        |        |        |        |        |        |        |        |        | 1                   | 9              | 10              |
| QC VS QRF                                 | X               |        | X              | X      |        |        |        |        | X      |        |        | X      | 5                   | 5              | 10              |
| QC VS QVF                                 |                 |        | X              | X      |        |        |        |        | X      |        |        | X      | 4                   | 6              | 10              |
| QRF VS QVF                                | X               |        |                |        |        |        |        |        |        |        |        |        | 1                   | 9              | 10              |
| KSSW VS QC                                | X               |        |                |        |        |        |        |        | X      |        |        | X      | 3                   | 7              | 10              |
| KSSW VS QRF                               |                 |        |                |        |        |        |        |        |        |        |        |        | 0                   | 10             | 10              |
| KSSW VS KCL                               |                 |        |                |        |        |        |        |        |        |        |        |        | 0                   | 10             | 10              |
| KSSW VS QVF                               | X               |        |                |        |        |        |        |        |        |        |        |        | 1                   | 9              | 10              |
| KSSW VS KSSU                              |                 |        |                | X      |        |        |        |        |        |        |        |        | 1                   | 9              | 10              |
| NORTH VS SOUTH                            | 0 3155          | 0 4704 | 0 5531         | 0 4283 | 0 0990 | 0 2236 | 0 4278 | 0 0613 | 0 1136 | 0 8488 | 0      |        | 0                   | 10             | 10              |

\*Normally distributed

\*\*The probability of obtaining a greater difference between the lithologic units

than the one observed

\*\*\*Multiple comparisons are run comparing each lithologic unit against another An "X" indicates that a significant difference occurs between the two lithologies for that analyte

M = MANOVA

A = ANOVA

K = nonparametric ANOVA (Kruskal-Wallis)

T = Test of Proportions







TABLE 5-6 STATISTICAL COMPARISON CHART FOR BOREHOLES TOTAL METALS

| ANALYSIS TECHNIQUE     | K      | T      | T     | T     | T     | T     | T     | T     | T     | K | N | NO <sub>2</sub> /NO <sub>3</sub> | Number different | Number same | Total number |
|------------------------|--------|--------|-------|-------|-------|-------|-------|-------|-------|---|---|----------------------------------|------------------|-------------|--------------|
| DISTRIBUTION           |        |        |       |       |       |       |       |       |       |   |   |                                  |                  |             |              |
| ANALYTE (Total Metals) | Zn     | Co     | Hg    | K     | Ag    | Sr    | Sn    | pH    |       |   |   |                                  |                  |             |              |
| PROBABILITY....        | 0 0001 | 0 4800 | 0 499 | 0 064 | 0 517 | 0 001 | 0 680 | 0 002 | 0 052 |   |   |                                  |                  |             |              |
| KCL VS KSS....         |        |        |       |       |       |       |       |       |       |   |   | 1                                | 23               | 24          |              |
| KCL VS QC              |        |        |       |       |       |       |       |       |       |   |   | 1                                | 23               | 24          |              |
| KCL VS QRF             | X      |        |       |       |       | X     |       | X     |       |   |   | 10                               | 14               | 24          |              |
| KSS VS QC              |        |        |       |       |       |       |       |       |       |   |   | 2                                | 22               | 24          |              |
| KSS VS QRF             |        |        |       |       |       | X     |       |       |       |   |   | 4                                | 20               | 24          |              |
| QC VS QRF              | X      |        |       |       |       | X     |       |       |       |   |   | 7                                | 17               | 24          |              |
| NORTH VS SOUTH         | 0 0450 | 0 3530 | 0 005 | 0 364 | 1 000 | 0 001 | 0 018 | 0 073 | 0 006 |   |   | 13                               | 11               | 24          |              |

\*Lognormally distributed

\*\*Normally distributed

\*\*\*The probability of obtaining a greater difference between the lithologic units

than the one observed

\*\*\*\*Multiple comparisons are run comparing each lithologic unit against another An "X" indicates that a significant difference occurs between the two lithologies for that analyte

M = MANOVA

A = ANOVA

K = nonparametric ANOVA (Kruskal-Wallis)

T = Test of Proportions





TABLE 5-8 COMPARISON OF MEAN TDS FOR GROUND WATER GROUPS

| Well number                    | Qrf wells TDS (mg/l) | Well number | Qrf wells TDS (mg/l) | Well number | Qc wells TDS (mg/l) | Well number | Kcl wells TDS (mg/l) | Well number   | Kss weathered TDS (mg/l) | Well number     | Kss unweathered TDS (mg/l) |
|--------------------------------|----------------------|-------------|----------------------|-------------|---------------------|-------------|----------------------|---------------|--------------------------|-----------------|----------------------------|
| B200589                        | 210                  | B102289     | 800                  | B201189     | 520                 | B203289     | 270                  | B402189       | 220                      | B203789         | 260                        |
| B200589                        | 230                  | B102289     | 330                  | B201189     | 550                 | B203289     | 260                  | B402189       | 170                      | B203789         | 240                        |
| B200589                        | 96                   | B102289     | 140                  | B201189     | 550                 | B203289     | 270                  | B402189       | 300                      | B203989         | 230                        |
| B200689                        | 160                  | B102389     | 370                  | B205589     | 950                 | B203489     | 320                  | B405789       | 180                      | B203989         | 200                        |
| B200689                        | 210                  | B102389     | 270                  | B205589     | 900                 | B203689     | 210                  | B405789       | 180                      | B203989         | 240                        |
| B200789                        | 210                  | B102389     | 270                  | B401989     | 290                 | B203689     | 210                  | B405789       | 170                      | B204189         | 1550*                      |
| B200789                        | 180                  | B202489     | 200                  | B401989     | 420                 | B305389     | 320                  | B304289       |                          | B304289         | 420                        |
| B200789                        | 150                  | B202489     | 220                  | B401989     | 360                 | B305389     | 370                  | B304289       |                          | B304289         | 440                        |
| B200789                        | 160                  | B202489     | 370                  |             |                     | B305389     | 320                  | B304289       |                          | B304289         | 430                        |
| B200889                        | 280                  | B202589     | 290                  |             |                     | B405489     | 220                  | B304989       |                          | B304989         | 560                        |
| B200889                        | 230                  | B202589     | 340                  |             |                     | B405489     | 190                  | B304989       |                          | B304989         | 660                        |
| B200889                        | 300                  | B202589     | 300                  |             |                     | B405489     | 200                  | B405289       |                          | B405289         | 940                        |
| B400189                        | 170                  | B302789     | 360                  |             |                     |             |                      |               |                          |                 |                            |
| B400189                        | 120                  | B302889     | 460                  |             |                     |             |                      |               |                          |                 |                            |
| B400189                        | 150                  | B302889     | 490                  |             |                     |             |                      |               |                          |                 |                            |
| B400289                        | 150                  | B302889     | 470                  |             |                     |             |                      |               |                          |                 |                            |
| B400289                        | 130                  | B302889     | 560                  |             |                     |             |                      |               |                          |                 |                            |
| B400289                        | 150                  | B302889     | 640                  |             |                     |             |                      |               |                          |                 |                            |
| B400389                        | 300                  | B303089     | 3300*                |             |                     |             |                      |               |                          |                 |                            |
| B400389                        | 270                  | B402689     | 380                  |             |                     |             |                      |               |                          |                 |                            |
| B400389                        | 240                  |             |                      |             |                     |             |                      |               |                          |                 |                            |
| B400489                        | 220                  |             |                      |             |                     |             |                      |               |                          |                 |                            |
| B400489                        | 240                  |             |                      |             |                     |             |                      |               |                          |                 |                            |
| B405586                        | 135                  |             |                      |             |                     |             |                      |               |                          |                 |                            |
| B405586                        | 260                  |             |                      |             |                     |             |                      |               |                          |                 |                            |
| B405586                        | 130                  |             |                      |             |                     |             |                      |               |                          |                 |                            |
| B405586                        | 150                  |             |                      |             |                     |             |                      |               |                          |                 |                            |
| B405689                        | 250                  |             |                      |             |                     |             |                      |               |                          |                 |                            |
| B405689                        | 270                  |             |                      |             |                     |             |                      |               |                          |                 |                            |
| B405689                        | 240                  |             |                      |             |                     |             |                      |               |                          |                 |                            |
| B405789                        | 180                  |             |                      |             |                     |             |                      |               |                          |                 |                            |
| B405789                        | 180                  |             |                      |             |                     |             |                      |               |                          |                 |                            |
| B405789                        | 170                  |             |                      |             |                     |             |                      |               |                          |                 |                            |
| MEAN TDS<br>(outliers removed) | 197 61               | Qrf         | 382 11               | Qc          | 567 50              | Kcl         | 263 33               | Kss weathered | 203 33                   | Kss unweathered | 420 00                     |

\*these values have been excluded from the calculation  
see text for explanation

TABLE 5-9 COMPARISON OF TDS AND TSS BETWEEN STREAM CHANNEL AND SEEP SURFACE WATER STATIONS

| Stream Channel Stations |            |            | Seep Stations |         |          |
|-------------------------|------------|------------|---------------|---------|----------|
| STATION                 | TDS (mg/l) | TSS (mg/l) | STATION       | TDS     | TSS      |
| SW004                   | 180 00     | 5 00       | SW080         | 120 00  | 4200 00  |
| SW004                   | 220 00     | 27 00      | SW080         | 310 00  | 25000 00 |
|                         |            |            | SW080         | 390 00  | 16000 00 |
| mean                    | 200 00     | 16 00      | SW080         | 210 00  | 670 00   |
|                         |            |            | SW080         | 190 00  | 180 00   |
| SW005                   | 140 00     | 6 00       | SW080         | 18 00   | 2000 00  |
| SW005                   | 120 00     | 5 00       | SW080         | 250 00  | 480 00   |
| SW005                   | 150 00     | 16 00      |               |         |          |
| SW005                   | 140 00     | 5 00       | mean          | 212 57  | 6932 86  |
| SW005                   | 150 00     | 6 00       |               |         |          |
| SW005                   | 150 00     | 11 00      | SW104         | 290 00  | 340 00   |
| SW005                   | 140 00     | 5 00       | SW104         | 240 00  | 980 00   |
| SW005                   | 130 00     | ND         | SW104         | 190 00  | 1000 00  |
|                         |            |            | SW104         | 190 00  | 3000 00  |
| mean                    | 140 00     | 7 71       | SW104         | 72 00   | 2400 00  |
|                         |            |            | SW104         | 180 00  | 10 00    |
| SW006                   | 140 00     | 26 00      | SW104         | 180 00  | 8 00     |
| SW006                   | 150 00     | 36 00      | SW104         | 190 00  | 5 00     |
| SW006                   | 170 00     | 15 00      | SW104         | 160 00  | 5 00     |
| SW006                   | 150 00     | 100 00     |               |         |          |
| SW006                   | 150 00     | 100 00     | mean          | 188 00  | 860 89   |
| SW006                   | 170 00     | 12 00      |               |         |          |
| SW006                   | 180 00     | 12 00      | SW108         | 220 00  | 5 00     |
| SW006                   | 120 00     | 5 00       | SW108         | 280 00  | 96 00    |
| SW006                   | 110 00     | 9 00       | SW108         | 260 00  | 92 00    |
| SW006                   | 100 00     | 10 00      | SW108         | 310 00  | 41 00    |
| SW006                   | 200 00     | 18 00      | SW108         | 460 00  | 2500 00  |
|                         |            |            | SW108         | 1100 00 | 5 00     |
| mean                    | 149 09     | 31 18      | mean          | 438 33  | 456 50   |
|                         |            |            |               |         |          |
| SW007                   | 200 00     | 19 00      |               |         |          |
| SW007                   | 180 00     | 32 00      |               |         |          |
| SW007                   | 170 00     | 22 00      |               |         |          |
| mean                    | 183 33     | 24 33      |               |         |          |
|                         |            |            |               |         |          |
| SW041                   | 200 00     | 92 00      |               |         |          |
| SW041                   | 190 00     | 90 00      |               |         |          |
| SW041                   | 120 00     | 150 00     |               |         |          |
| SW041                   | 270 00     | 130 00     |               |         |          |
| SW041                   | 160 00     | 5 00       |               |         |          |
| mean                    | 188 00     | 93 40      |               |         |          |
|                         |            |            |               |         |          |
| SW107                   | 140 00     | 7 00       |               |         |          |
| SW107                   | 160 00     | 5 00       |               |         |          |
| SW107                   | 110 00     | 400 00     |               |         |          |
| SW107                   | 92 00      | 8 00       |               |         |          |
| SW107                   | 58 00      | 18 00      |               |         |          |
| mean                    | 112 00     | 87 60      |               |         |          |
|                         |            |            |               |         |          |
|                         | TDS        | TSS        |               | TDS     | TSS      |
| Group Mean              | 153 24     | 42 64      |               | 264 09  | 2682 59  |

ND = No data for that sample

Table 5-10  
Statistics for Dissolved Metal Concentrations in  
Background Rocky Flats Alluvial Ground Water Samples  
(Concentration units mg/l)

|                       | Al     | Sb      | As     | Ba     | Be     | Cd     | Ca      | Cs     | Cr     | Co     | Cu     | Fe     | Pb     | Li     |
|-----------------------|--------|---------|--------|--------|--------|--------|---------|--------|--------|--------|--------|--------|--------|--------|
| Normal or Log Normal* | Normal | Normal  | Normal | Normal | Normal | Normal | Log     | Normal | Normal | Normal | Normal | Normal | Normal | Normal |
| Upper Tolerance Limit | .      | .       | .      | .      | .      | .      | 43 5726 | .      | .      | .      | .      | .      | .      | .      |
| Lower Tolerance Limit | .      | .       | .      | .      | .      | .      | .       | .      | .      | .      | .      | .      | .      | .      |
| Maximum Concentration | 0.2U   | 0.5U    | 0.01U  | 0.116  | 0.005U | 0.0111 | 75.0    | 2.5U   | 0.02U  | 0.05U  | 0.0201 | 0.266  | 0.0054 | 0.1U   |
| Minimum Concentration | 0.03U  | 0.0265U | 0.001U | 0.0625 | 0.002U | 0.004U | 17.0    | 0.005U | 0.009U | 0.02U  | 0.004U | 0.03U  | 0.002U | 0.004  |
| Cohen or Unrevised    | UN     | UN      | UN     | UN     | UN     | UN     | UN      | UN     | UN     | UN     | UN     | UN     | UN     | UN     |
| Mean                  | 0.0835 | 0.0670  | 0.0038 | 0.0951 | 0.0020 | 0.0028 | 36.6861 | 0.4466 | 0.0061 | 0.0218 | 0.0116 | 0.0706 | 0.0022 | 0.0402 |
| Standard Deviation    | 0.0311 | 0.0851  | 0.0019 | 0.0119 | 0.0007 | 0.0017 | 3.1023  | 0.2343 | 0.0021 | 0.0060 | 0.0033 | 0.0576 | 0.0008 | 0.0184 |
| Sample Size           | 23     | 29      | 21     | 30     | 22     | 30     | 30      | 29     | 25     | 30     | 27     | 27     | 29     | 26     |
| Percent Detected      | 17.4   | 0.0     | 0.0    | 26.7   | 0.0    | 6.7    | 100.0   | 0.0    | 4.0    | 0.0    | 3.7    | 25.9   | 6.9    | 19.2   |
| Classification Method | KA     | KA      | KA     | KA     | KA     | KA     | KA      | A      | KA     | KA     | KA     | KA     | KA     | KA     |

|                       | Mg     | Mn     | Hg      | Mo     | Mt     | K      | Se     | Ag     | Na     | Sr     | Tl     | Sn     | V      | Zn     |
|-----------------------|--------|--------|---------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Normal or Log Normal* | Log    | Log    | Normal  | Normal | Normal | Normal | Normal | Normal | Log    | Normal | Normal | Normal | Normal | Normal |
| Upper Tolerance Limit | .      | 0.1356 | .       | .      | .      | .      | .      | .      | 8.8696 | .      | .      | .      | .      | .      |
| Lower Tolerance Limit | .      | .      | .       | .      | .      | .      | .      | .      | .      | .      | .      | .      | .      | .      |
| Maximum Concentration | 5.79   | 0.268  | 0.0002U | 0.5U   | 0.0432 | 7.73   | 0.05U  | 0.03U  | 11.0   | 1.0U   | 0.04U  | 1.0U   | 0.05U  | 0.141  |
| Minimum Concentration | 5.0U   | 0.01U  | 0.0002U | 0.027U | 0.02U  | 0.208  | 0.001U | 0.004U | 5.0U   | 0.1U   | 0.001U | 0.1U   | 0.01U  | 0.01U  |
| Cohen or Unrevised    | UN     | C      | UN      | UN     | UN     | UN     | UN     | UN     | UN     | UN     | UN     | UN     | UN     | UN     |
| Mean                  | 3.5688 | 0.0706 | 0.0001  | 0.0797 | 0.0188 | 2.2882 | 0.0033 | 0.0065 | 7.7573 | 0.3513 | 0.0058 | 0.1375 | 0.0210 | 0.0258 |
| Standard Deviation    | 0.2361 | 0.0291 | 0.0000  | 0.0782 | 0.0065 | 1.3731 | 0.0047 | 0.0040 | 0.5011 | 0.1872 | 0.0052 | 0.1762 | 0.0077 | 0.0290 |
| Sample Size           | 30     | 29     | 24      | 30     | 27     | 25     | 27     | 29     | 30     | 30     | 28     | 28     | 29     | 23     |
| Percent Detected      | 43.3   | 72.4   | 0.0     | 3.3    | 7.4    | 28.0   | 3.7    | 0.0    | 93.3   | 33.3   | 0.0    | 0.0    | 0.0    | 47.8   |
| Classification Method | KA     | KA     | KA      | KA     | KA     | KA     | KA     | KA     | KA     | KA     | KA     | KA     | KA     | KA     |

\*=Normal or log normal data distributions were assumed. All statistics presented are untransformed (antilog) values. U=Concentration below detection limit M=MANOVA  
.=Value not computed C=Cohen revised statistics UN=Unrevised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table 5-11  
Statistics for Inorganic Concentrations in  
Background Rocky Flats Alluvial Ground Water Samples  
(Concentration units mg/l except pH)

|                       | HC03     | CO3    | Cl | CN      | Field pH | NO3/NO2 | SO4     |
|-----------------------|----------|--------|----|---------|----------|---------|---------|
| Normal or Log Normal* | Log      | Normal |    | Normal  | Normal   | Log     | Log     |
| Upper Tolerance Limit | 146.7346 | .      |    |         | 8.3193   | 2.1734  | 25.2270 |
| Lower Tolerance Limit | .        | .      |    |         | 6.0781   | .       | .       |
| Maximum Concentration | 450.0    | 5.0U   |    | 0.01U   | 8.6      | 2.8     | 39.0    |
| Minimum Concentration | 56.0     | 5.0U   |    | 0.0025U | 6.3      | 0.07    | 10.0    |
| Cohen or Unrevised    | UN       | UN     |    | UN      | UN       | UN      | UN      |
| Mean                  | 125.6275 | 2.5000 |    | 0.0032  | 7.1987   | 1.6568  | 22.6385 |
| Standard Deviation    | 9.7824   | 0.0000 |    | 0.0018  | 0.5234   | 0.2394  | 1.1997  |
| Sample Size           | 36       | 35     |    | 26      | 38       | 36      | 36      |
| Percent Detected      | 100.0    | 0.0    |    | 7.7     | 100.0    | 100.0   | 100.0   |
| Classification Method | A        | -      |    | -       | KA       | KA      | KA      |

\*=Normal or log normal data distributions were assumed. All statistics presented are unrevised (antilog) values. U=Concentration below detection limit M=MANOVA  
.=Value not computed C=Cohen revised statistics UN=Unrevised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table 5-12  
Statistics for Inorganic Concentrations in  
Background North Rocky Flats Rocky Flats Alluvial Ground Water Samples  
(Concentration units mg/l except pH)

|                       | HCO <sub>3</sub> | CO <sub>3</sub> | Cl     | CN | Field pH | NO <sub>3</sub> /NO <sub>2</sub> | SO <sub>4</sub> |
|-----------------------|------------------|-----------------|--------|----|----------|----------------------------------|-----------------|
| Normal or Log Normal* |                  |                 |        |    |          |                                  |                 |
| Upper Tolerance Limit | .                | .               |        | .  | .        | .                                | .               |
| Lower Tolerance Limit | .                | .               |        | .  | .        | .                                | .               |
| Maximum Concentration |                  |                 |        |    |          |                                  |                 |
| Minimum Concentration |                  |                 |        |    |          |                                  |                 |
| Cohen or Unrevised    |                  |                 |        |    |          |                                  |                 |
| Mean                  |                  |                 | UN     |    |          |                                  |                 |
| Standard Deviation    | .                |                 | 5 7419 | .  | .        | .                                | .               |
| Sample Size           | .                |                 | 0.7141 | .  | .        | .                                | .               |
| Percent Detected      |                  |                 | 15     |    |          |                                  |                 |
|                       |                  |                 | 100 0  |    |          |                                  |                 |
| Classification Method |                  |                 | KA     |    |          |                                  |                 |

\*=Normal or log normal data distributions were assumed. All statistics presented are untransformed (antilog) values. U=Concentration below detection limit M=MANOVA  
.=Value not computed C=Cohen revised statistics UN=Unrevised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table 5-13

Statistics for Inorganic Concentrations in  
Background South Rocky Flats Rocky Flats Alluvial Ground Water Samples  
(Concentration units mg/l except pH)

|                       | HC03 | C03 | Cl     | CN | Field pH | NO3/NO2 | SO4 |
|-----------------------|------|-----|--------|----|----------|---------|-----|
| Normal or Log Normal* |      |     |        |    |          |         |     |
| Upper Tolerance Limit | .    | .   |        |    |          |         | .   |
| Lower Tolerance Limit | .    |     |        |    |          |         |     |
| Maximum Concentration |      |     |        |    |          |         |     |
| Minimum Concentration |      |     | 15.0   |    |          |         |     |
|                       |      |     | 3.00   |    |          |         |     |
| Cohen or Unrevised    |      |     | C      |    |          |         |     |
| Mean                  | .    | .   | 7.1788 |    |          | .       |     |
| Standard Deviation    | .    | .   | 1.6277 |    |          | .       |     |
| Sample Size           |      |     | 21     |    |          |         |     |
| Percent Detected      |      |     | 81.0   |    |          |         |     |
| Classification Method |      |     | KA     |    |          |         |     |

\*=Normal or log normal data distributions were assumed. All statistics presented are untransformed (antilog) values. U=Concentration below detection limit M=MANOVA  
.=Value not computed C=Cohen revised statistics UN=Unrevised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table 5-14  
Statistics for Dissolved Radiochemical Concentrations in  
Background Rocky Flats Alluvial Ground Water Samples  
(Concentration units pCi/l)

|                         | Am241  | Cs137  | Alpha  | Beta   | Pu239  | Ra226   | Ra228  | Sr90     | Tritium  | U233,234 | U235   | U238   |
|-------------------------|--------|--------|--------|--------|--------|---------|--------|----------|----------|----------|--------|--------|
| Normal or Log Normal[*] | Normal | Normal | Normal | Normal | Normal | Normal  | Normal | Normal   | Normal   | Normal   | Normal | Normal |
| Upper Tolerance Limit   | 0.0197 | 0.6237 | 7.7990 | 8.7694 | 0.0118 |         | 1.2300 |          | 454.2380 |          | 0.1601 | 0.9806 |
| Lower Tolerance Limit   | .      | .      | .      | .      | .      |         |        |          |          |          |        |        |
| Maximum Concentration   | 0.031  | 0.5    | 12.0   | 13.0   | 0.017  | 170.0   | 2.13   | 390.0    | 0.1      | 0.23     | 1.1    |        |
| Minimum Concentration   | 0.0    | -0.4   | -1.0   | -1.0   | 0.0    | 0.025   | -0.7   | -370.0   | 0.1      | -0.08    | -0.1   |        |
| Cohen or Unrevised      | UN     | UN     | UN     | UN     | UN     | UN      | UN     | UN       | UN       | UN       | UN     | UN     |
| Mean                    | 0.0025 | 0.0936 | 2.0179 | 2.4857 | 0.0019 | 28.5708 | 0.1286 | 110.3704 | 0.1000   | 0.0221   | 0.2654 |        |
| Standard Deviation      | 0.0074 | 0.2361 | 2.5742 | 2.7980 | 0.0044 | 69.2861 | 0.4904 | 152.1508 | .        | 0.0614   | 0.3185 |        |
| Sample Size             | 24     | 28     | 28     | 28     | 27     | 6       | 28     | 27       | 1        | 28       | 28     |        |
| Percent Detected        | 100.0  | 100.0  | 100.0  | 100.0  | 100.0  | 100.0   | 100.0  | 100.0    | 100.0    | 100.0    | 100.0  |        |
| Classification Method   | KA     | A      | KA     | KA     | KA     | KA      | KA     | A        | -        | KA       | KA     |        |

\*=Normal or log normal data distributions were assumed. All statistics presented are unrevised (antilog) values U=Concentration below detection limit M=MANOVA  
.=Value not computed C=Cohen revised statistics UN=Unrevised statistics A=Parametric ANOVA K=Kruskal-Hallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table 5-15  
Statistics for Dissolved Metal Concentrations in  
Background Colluvial Ground Water Samples  
(Concentration units mg/l)

[illegible]

\*=Normal or log normal data distributions were assumed. All statistics presented are untransformed (antilog) values. U=Cohen revised statistics UN=Unrevised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_\_=No classification p=Test of Proportions  
 .=.Value not computed C=Cohen revised statistics

Table 5-16

Statistics for Inorganic Concentrations in  
Background Colluvial Ground Water Samples  
(Concentration units mg/l except pH)

|                       | HCO <sub>3</sub> | CO <sub>3</sub> | Cl | CN      | Field pH | NO <sub>3</sub> /NO <sub>2</sub> | SO <sub>4</sub> |
|-----------------------|------------------|-----------------|----|---------|----------|----------------------------------|-----------------|
| Normal or Log Normal* | Log              | Normal          |    | Normal  | Normal   | Log                              | Log             |
| Upper Tolerance Limit | 568.1777         |                 |    | .       | 8.0347   | 5.1725                           | 296.1911        |
| Lower Tolerance Limit | .                |                 |    |         | 6.4986   | .                                |                 |
| Maximum Concentration | 680.0            | 5.0U            |    | 0.01U   | 7.7      | 6.5                              | 780.0           |
| Minimum Concentration | 190.0            | 5.0U            |    | 0.0025U | 6.7      | 0.05U                            | 41.0            |
| Cohen or Unrevised    | UN               | UN              |    | UN      | UN       | C                                | UN              |
| Mean                  | 398.5286         | 2.5000          | .  | 0.0029  | 7.2667   | 1.2723                           | 152.2558        |
| Standard Deviation    | 58.2794          | 0.0000          | .  | 0.0020  | 0.2807   | 1.1473                           | 49.4459         |
| Sample Size           | 10               | 10              |    | 9       | 12       | 7                                | 10              |
| Percent Detected      | 100.0            | 0.0             |    | 0.0     | 100.0    | 57.1                             | 100.0           |
| Classification Method | -                | -               |    | -       | KA       | -                                | -               |

\*=Normal or log normal data distributions were assumed. All statistics presented are untransformed (antilog) values. U=Concentration below detection limit M=MANOVA  
 .=Value not computed C=Cohen revised statistics UN=Unrevised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table 5-17  
Statistics for Inorganic Concentrations in  
Background North Rocky Flats Colluvial Ground Water Samples  
(Concentration units mg/l except pH)

|                       | HCO3 | CO3 | Cl      | CN | Field pH | NO3/NO2 | SO4 |
|-----------------------|------|-----|---------|----|----------|---------|-----|
| Normal or Log Normal* |      |     |         |    |          |         |     |
| Upper Tolerance Limit | .    |     |         | .  | .        | .       | .   |
| Lower Tolerance Limit |      |     |         | .  | .        |         |     |
| Maximum Concentration |      |     | 28 0    |    |          |         |     |
| Minimum Concentration |      |     | 11 0    |    |          |         |     |
| Cohen or Unrevised    |      |     | UN      |    |          |         |     |
| Mean                  |      |     | 16 7937 | .  | .        | .       | .   |
| Standard Deviation    | .    | .   | 2 6773  | .  | .        | .       | .   |
| Sample Size           |      |     | 6       |    |          |         |     |
| Percent Detected      |      |     | 100 0   |    |          |         |     |
| Classification Method |      |     | -       |    |          |         |     |

\*=Normal or log normal data distributions were assumed All statistics presented are untransformed (antilog) values U=Concentration below detection limit M=MANOVA  
.=Value not computed C=Cohen revised statistics UN=Unrevised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table 5-18  
Statistics for Inorganic Concentrations in  
Background South Rocky Flats Colluvial Ground Water Samples  
(Concentration units mg/l except pH)

|                       | HCO3 | CO3 | Cl      | CN | Field pH | NO3/NO2 | SO4 |
|-----------------------|------|-----|---------|----|----------|---------|-----|
| Normal or Log Normal* |      |     |         |    |          |         |     |
| Upper Tolerance Limit |      | .   |         |    |          | .       |     |
| Lower Tolerance Limit |      |     | .       |    |          |         | .   |
| Maximum Concentration |      |     | 20.0    |    |          |         |     |
| Minimum Concentration |      |     | 16.0    |    |          |         |     |
| Cohen or Unrevised    |      |     | UN      |    |          |         |     |
| Mean                  | .    |     | 18.0002 |    | .        | .       | .   |
| Standard Deviation    | .    | .   | 0.8200  |    | .        | .       | .   |
| Sample Size           |      |     | 4       |    |          |         |     |
| Percent Detected      |      |     | 100.0   |    |          |         |     |
| Classification Method |      |     |         |    |          |         |     |

\*=Normal or log normal data distributions were assumed. All statistics presented are untransformed (antilog) values. U=Concentration below detection limit H=HANOVA  
.=Value not computed C=Cohen revised statistics UN=Unrevised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA =No classification P=Test of Proportions

Table 5-19  
Statistics for Dissolved Radiochemical Concentrations in  
Background Colluvial Ground Water Samples  
(Concentration units pCi/l)

|                       | Az241   | Cs137  | Alpha    | Beta     | Pu239  | Ra226  | Ra228  | Sr90     | Iritium  | U233,234 | U235    | U238     |
|-----------------------|---------|--------|----------|----------|--------|--------|--------|----------|----------|----------|---------|----------|
| Normal or Log Normal* | Normal  | Normal | Normal   | Normal   | Normal | Normal | Normal | Normal   | Normal   | Normal   | Normal  | Normal   |
| Upper Tolerance Limit | 0.0110  | 0.9228 | 227.6457 | 248.8590 | 0.0114 | .      | .      | 0.4191   | 337.8201 | .        | 9.1104  | 107.8223 |
| Lower Tolerance Limit | .       | .      | .        | .        | .      | .      | .      | .        | .        | .        | .       | .        |
| Maximum Concentration | 0.0     | 0.4    | 200.0    | 220.0    | 0.008  | 2.8    | 0.28   | 140.0    | 76.9     | 7.74     | 0.0     | 0.3      |
| Minimum Concentration | -0.01   | -0.6   | 0.0      | 2.0      | 0.0    | 0.4    | -0.2   | -170.0   | 0.0      | 0.0      | 0.0     | 0.3      |
| Cohen or Unrevised    | UN      | UN     | UN       | UN       | UN     | UN     | UN     | UN       | UN       | UN       | UN      | UN       |
| Mean                  | -0.0017 | 0.0200 | 35.1111  | 38.6222  | 0.0011 | 1.1250 | 0.0222 | 15.5556  | 1.3544   | 1.3544   | 18.8533 | 18.8533  |
| Standard Deviation    | 0.0037  | 0.2978 | 63.5168  | 69.3567  | 0.0030 | 1.1295 | 0.1309 | 106.3145 | 2.5587   | 2.5587   | 29.3507 | 29.3507  |
| Sample Size           | 7       | 9      | 9        | 9        | 7      | 4      | 9      | 9        | 9        | 9        | 9       | 9        |
| Percent Detected      | 100.0   | 100.0  | 100.0    | 100.0    | 100.0  | 100.0  | 100.0  | 100.0    | 100.0    | 100.0    | 100.0   | 100.0    |
| Classification Method | KA      | A      | KA       | KA       | KA     | KA     | KA     | KA       | A        | KA       | KA      | KA       |

\*=Normal or log normal data distributions were assumed. All statistics presented are untransformed (antilog) values U=Concentration below detection limit M=MANOVA  
.=Value not computed C=Cohen revised statistics UN=Unrevised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions



Table 5-21  
Statistics for Inorganic Concentrations in  
Background Valley Fill Alluvial Ground Water Samples  
(Concentration units mg/l except pH)

|                       | HC03     | CO3    | Cl | CN      | Field pH | NO3/NO2 | SO4      |
|-----------------------|----------|--------|----|---------|----------|---------|----------|
| Normal or Log Normal* | Log      | Normal |    | Normal  | Normal   | Log     | Log      |
| Upper Tolerance Limit | 350.6604 | .      | .  |         | 7.9067   | 2.6803  | 175.2758 |
| Lower Tolerance Limit |          |        |    |         | 6.4361   |         | .        |
| Maximum Concentration | 610.0    | 5.0U   |    | 0.01U   | 7.8      | 3.1     | 1800.0   |
| Minimum Concentration | 110.0    | 5.0U   |    | 0.0025U | 6.6      | 0.05U   | 13.0     |
| Cohen or Unrevised    | UN       | UN     |    | UN      | UN       | C       | UN       |
| Mean                  | 277.9386 | 2.5000 | .  | 0.0027  | 7.1714   | 0.9020  | 107.3990 |
| Standard Deviation    | 30.6659  | 0.0000 | .  | 0.0019  | 0.3101   | 0.7499  | 28.6228  |
| Sample Size           | 21       | 21     |    | 16      | 21       | 21      | 21       |
| Percent Detected      | 100.0    | 0.0    |    | 0.0     | 100.0    | 52.4    | 100.0    |
| Classification Method | A        | -      |    | -       | KA       | KA      | KA       |

\*=Normal or log normal data distributions were assumed. All statistics presented are untransformed (antilog) values U=Concentration below detection limit N=MANOVA  
.=Value not computed C=Cohen revised statistics UN=Unrevised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table 5-22  
Statistics for Inorganic Concentrations in  
Background North Rocky Flats Valley Fill Alluvial Ground Water Samples  
(Concentration units mg/l except pH)

|                       | HCO3 | CO3 | Cl      | CN | Field pH | NO3/NO2 | SO4 |
|-----------------------|------|-----|---------|----|----------|---------|-----|
| Normal or Log Normal* |      |     |         |    |          |         |     |
|                       |      |     | Log     |    |          |         |     |
| Upper Tolerance Limit | .    | .   | 11.3029 | .  | .        | .       | .   |
| Lower Tolerance Limit | .    | .   | .       | .  | .        | .       | .   |
| Maximum Concentration |      |     | 11.0    |    |          |         |     |
| Minimum Concentration |      |     | 3.00    |    |          |         |     |
| Cohen or Unrevised    |      |     | UN      |    |          |         |     |
| Mean                  |      | .   | 7.9800  | .  | .        | .       | .   |
| Standard Deviation    |      | .   | 1.2144  | .  | .        | .       | .   |
| Sample Size           |      |     | 12      |    |          |         |     |
| Percent Detected      |      |     | 91.7    |    |          |         |     |
| Classification Method |      |     | KA      |    |          |         |     |

\*=Normal or log normal data distributions were assumed. All statistics presented are unrevised (antilog) values. U=Concentration below detection limit M=MANOVA  
.=Value not computed C=Cohen revised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table 5-23  
Statistics for Inorganic Concentrations in  
Background South Rocky Flats Valley Fill Alluvial Ground Water Samples  
(Concentration units mg/l except pH)

|                       | HCO3 | CO3 | Cl      | CM | Field pH | NO3/NO2 | SO4 |
|-----------------------|------|-----|---------|----|----------|---------|-----|
| Normal or Log Normal* |      |     |         |    |          |         |     |
| Upper Tolerance Limit | .    | .   | 63.3271 | .  | .        | .       | .   |
| Lower Tolerance Limit | .    | .   | .       | .  | .        | .       | .   |
| Maximum Concentration |      |     | 160.0   |    |          |         |     |
| Minimum Concentration |      |     | 14.0    |    |          |         |     |
| Cohen or Unrevised    |      |     | UN      |    |          |         |     |
| Mean                  | .    | .   | 36 8487 | .  | .        | .       | .   |
| Standard Deviation    | .    | .   | 8.7352  |    | .        | .       | .   |
| Sample Size           |      |     | 9       |    |          |         |     |
| Percent Detected      |      |     | 100.0   |    |          |         |     |
| Classification Method |      |     | -       |    |          |         |     |

\*=Normal or log normal data distributions were assumed. All statistics presented are untransformed (antilog) values U=Concentration below detection limit M=MANOVA  
.=Value not computed C=Cohen revised statistics UN=UNrevised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table 5-24  
Statistics for Dissolved Radiochemical Concentrations in  
Background Valley Fill Alluvial Ground Water Samples  
(Concentration units pCi/l)

|                       | Am241   | Cs137   | Alpha   | Beta    | Pu239  | Ra226  | Ra228  | Sr90   | Tritium  | U233,234 | U235   | U238   |
|-----------------------|---------|---------|---------|---------|--------|--------|--------|--------|----------|----------|--------|--------|
| Normal or Log Normal* | Normal  | Normal  | Normal  | Normal  | Normal | Normal | Normal | Normal | Normal   | Normal   | Normal | Normal |
| Upper Tolerance Limit | 0.0094  | 0.4474  | 10.5809 | 11.9209 | 0.0223 | .      | .      | 1.1843 | 511.5681 | .        | 0.3082 | 5 1501 |
| Lower Tolerance Limit | .       | .       | .       | .       | .      | .      | .      | .      | .        | .        | .      | .      |
| Maximum Concentration | 0 0     | 0.3     | 11 0    | 14.0    | 0 03   | 0.3    | 0.3    | 1 04   | 430.0    | .        | 0 34   | 5 5    |
| Minimum Concentration | -0 01   | -0.5    | 0.3     | 1 4     | 0 0    | -0 1   | -0 1   | -0.3   | -340.0   | .        | 0 0    | 0.1    |
| Cohen or Unrevised    | UN      | UN      | UN      | UN      | UN     | UN     | UN     | UN     | UN       | UN       | UN     | UN     |
| Mean                  | -0.0029 | -0.0047 | 3.8316  | 5 0526  | 0.0038 | 0 1333 | .      | 0.2721 | 89.0000  | .        | 0.0968 | 1.5274 |
| Standard Deviation    | 0.0047  | 0.1866  | 2.7855  | 2.8346  | 0.0075 | 0 2082 | .      | 0.3765 | 176.3639 | .        | 0.0872 | 1 4951 |
| Sample Size           | 14      | 19      | 19      | 19      | 18     | 3      | 3      | 19     | 20       | .        | 19     | 19     |
| Percent Detected      | 100 0   | 100.0   | 100.0   | 100.0   | 100.0  | 100 0  | 100 0  | 100.0  | 100.0    | .        | 100.0  | 100 0  |
| Classification Method | KA      | A       | KA      | KA      | KA     | -      | -      | KA     | A        | .        | KA     | KA     |

\*=Normal or log normal data distributions were assumed. All statistics presented are untransformed (antilog) values U=Concentration below detection limit M=MANOVA  
.=Value not computed C=Cohen revised statistics UN=Unrevised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table 5-25  
Statistics for Dissolved Metal Concentrations in  
Background Weathered Claystone Ground Water Samples  
(Concentration units mg/l)

|                       | Al     | Sb     | As     | Ba     | Be     | Cd     | Ca      | Cs     | Cr     | Co     | Cu     | Fe     | Pb     | L1     |
|-----------------------|--------|--------|--------|--------|--------|--------|---------|--------|--------|--------|--------|--------|--------|--------|
| Normal or Log Normal* | Normal | Normal | Normal | Normal | Normal | Normal | Log     | Normal | Normal | Normal | Normal | Normal | Normal | Normal |
| Upper Tolerance Limit | .      | .      | .      | .      | .      | .      | 76.7449 | .      | .      | .      | .      | .      | .      | .      |
| Lower Tolerance Limit | .      | .      | .      | .      | .      | .      | .       | .      | .      | .      | .      | .      | .      | .      |
| Maximum Concentration | 0.2U   | 0.5U   | 0.01U  | 0.2U   | 0.005U | 0.005U | 167.0   | 2.5U   | 0.02U  | 0.05U  | 0.0477 | 0.0909 | 0.0049 | 0.4    |
| Minimum Concentration | 0.0405 | 0.06U  | 0.002U | 0.05U  | 0.002U | 0.004U | 31.8    | 1.0U   | 0.01U  | 0.02U  | 0.025U | 0.1U   | 0.003U | 0.013U |
| Cohen or Unrevised    | UN     | UN     | UN     | UN     | UN     | UN     | UN      | UN     | UN     | UN     | UN     | UN     | UN     | UN     |
| Mean                  | 0.0933 | 0.0575 | 0.0043 | 0.0953 | 0.0023 | 0.0024 | 58.8797 | 0.6406 | 0.0056 | 0.0230 | 0.0168 | 0.0549 | 0.0024 | 0.0753 |
| Standard Deviation    | 0.0181 | 0.0751 | 0.0015 | 0.0188 | 0.0005 | 0.0002 | 7.0791  | 0.3023 | 0.0017 | 0.0053 | 0.0118 | 0.0130 | 0.0011 | 0.1062 |
| Sample Size           | 15     | 16     | 16     | 16     | 15     | 15     | 16      | 16     | 16     | 15     | 16     | 15     | 14     | 16     |
| Percent Detected      | 13.3   | 0.0    | 6.3    | 6.3    | 0.0    | 0.0    | 100.0   | 0.0    | 0.0    | 0.0    | 12.5   | 13.3   | 21.4   | 31.3   |
| Classification Method | KA     | KA     | KA     | KA     | KA     | KA     | KA      | A      | KA     | KA     | KA     | KA     | KA     | KA     |

|                       | Hg      | Mn     | Hg      | Mo     | Ni     | K      | Se     | Ag     | Na      | Sr     | Tl     | Sn     | V      | Zn     |
|-----------------------|---------|--------|---------|--------|--------|--------|--------|--------|---------|--------|--------|--------|--------|--------|
| Normal or Log Normal* | Log     | Log    | Normal  | Normal | Normal | Normal | Normal | Normal | Log     | Normal | Normal | Normal | Normal | Normal |
| Upper Tolerance Limit | 33.2559 | 0.4441 | .       | .      | .      | .      | .      | .      | 99.6049 | .      | .      | .      | .      | 0.1241 |
| Lower Tolerance Limit | .       | .      | .       | .      | .      | .      | .      | .      | .       | .      | .      | .      | .      | .      |
| Maximum Concentration | 179.0   | 0.846  | 0.0008  | 0.5U   | 0.04U  | 5.31   | 0.0628 | 0.03U  | 714.0   | 7.12   | 0.05U  | 1.0U   | 0.05U  | 0.107  |
| Minimum Concentration | 5.15    | 0.015U | 0.0002U | 0.015U | 0.02U  | 1.72   | 0.005U | 0.01U  | 13.4    | 0.198  | 0.003U | 0.1U   | 0.01U  | 0.02U  |
| Cohen or Unrevised    | UN      | C      | UN      | UN     | UN     | UN     | UN     | UN     | UN      | UN     | UN     | UN     | UN     | C      |
| Mean                  | 20.0602 | 0.1723 | 0.0002  | 0.0677 | 0.0183 | 2.6393 | 0.0095 | 0.0063 | 57.0263 | 0.8971 | 0.0059 | 0.1344 | 0.0225 | 0.0259 |
| Standard Deviation    | 5.2288  | 0.1077 | 0.0002  | 0.0728 | 0.0039 | 0.7661 | 0.0171 | 0.0034 | 16.8718 | 1.6735 | 0.0055 | 0.1814 | 0.0068 | 0.0367 |
| Sample Size           | 16      | 16     | 16      | 16     | 12     | 15     | 15     | 16     | 16      | 16     | 16     | 16     | 16     | 13     |
| Percent Detected      | 100.0   | 68.8   | 25.0    | 12.5   | 0.0    | 20.0   | 20.0   | 0.0    | 100.0   | 43.8   | 6.3    | 0.0    | 0.0    | 69.2   |
| Classification Method | KA      | KA     | KA      | KA     | KA     | KA     | KA     | KA     | KA      | KA     | KA     | KA     | KA     | KA     |

\*=Normal or log normal data distributions were assumed. All statistics presented are untransformed (antilog) values. U=Concentration below detection limit M=MANOVA  
.=Value not computed C=Cohen revised statistics UN=Unrevised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table 5-26  
Statistics for Inorganic Concentrations in  
Background Weathered Claystone Ground Water Samples  
(Concentration units mg/l except pH)

|                       | HCO3     | CO3    | Cl | CN      | Field pH | NO3/NO2 | SO4     |
|-----------------------|----------|--------|----|---------|----------|---------|---------|
| Normal or Log Normal* | Log      | Normal |    | Normal  | Normal   | Log     | Log     |
| Upper Tolerance Limit | 298.4996 |        |    |         | 8.6888   | 0.6143  | 49.3145 |
| Lower Tolerance Limit |          |        |    |         | 6.6168   |         |         |
| Maximum Concentration | 400.0    | 5.0U   |    | 0.01U   | 8.4      | 0.66    | 100.0   |
| Minimum Concentration | 144.0    | 5.0U   |    | 0.0025U | 7.0      | 0.05U   | 11.0    |
| Cohen or Unrevised    | UN       | UN     |    | UN      | UN       | UN      | UN      |
| Mean                  | 235.7107 | 2.5000 |    | 0.0033  | 7.6528   | 0.3413  | 33.4302 |
| Standard Deviation    | 22.9463  | 0.0000 |    | 0.0019  | 0.4223   | 0.1022  | 5.8049  |
| Sample Size           | 12       | 12     |    | 14      | 18       | 13      | 12      |
| Percent Detected      | 100.0    | 0.0    |    | 7.1     | 100.0    | 92.3    | 100.0   |
| Classification Method | A        | -      |    | -       | KA       | KA      | KA      |

\*=Normal or log normal data distributions were assumed. All statistics presented are untransformed (antilog) values. U=Concentration below detection limit H=MANOVA  
.=Value not computed C=Cohen revised statistics UN=Unrevised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table 5-27  
Statistics for Inorganic Concentrations in  
Background North Rocky Flats Weathered Claystone Ground Water Samples  
(Concentration units mg/l except pH)

|                       | HC03 | CO3 | Cl     | CM | Field pH | NO3/NO2 | SO4 |
|-----------------------|------|-----|--------|----|----------|---------|-----|
| Normal or Log Normal* |      |     |        |    |          |         |     |
| Upper Tolerance Limit | .    |     |        |    |          |         |     |
| Lower Tolerance Limit | .    |     |        |    |          |         |     |
| Maximum Concentration |      |     | 4.0    |    |          |         |     |
| Minimum Concentration |      |     | 3.00   |    |          |         |     |
| Cohen or Unrevised    |      |     | UN     |    |          |         |     |
| Mean                  | .    | .   | 1.8872 |    |          |         |     |
| Standard Deviation    | .    |     | 0.3083 |    |          |         |     |
| Sample Size           |      |     | 6      |    |          |         |     |
| Percent Detected      |      |     | 16.7   |    |          |         |     |
| Classification Method |      |     |        |    |          |         |     |

\*=Normal or log normal data distributions were assumed. All statistics presented are untransformed (antilog) values. U=Concentration below detection limit M=MANOVA  
.=Value not computed C=Cohen revised statistics UN=Unrevised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table 5-28  
Statistics for Inorganic Concentrations in  
Background South Rocky Flats Weathered Claystone Ground Water Samples  
(Concentration units mg/l except pH)

|                       | HCO <sub>3</sub> | CO <sub>3</sub> | Cl      | CN | Field pH | NO <sub>3</sub> /NO <sub>2</sub> | SO <sub>4</sub> |
|-----------------------|------------------|-----------------|---------|----|----------|----------------------------------|-----------------|
| Normal or Log Normal* |                  |                 |         |    |          |                                  |                 |
|                       |                  |                 | Log     |    |          |                                  |                 |
| Upper Tolerance Limit | .                |                 | .       |    |          |                                  | .               |
| Lower Tolerance Limit | .                |                 | .       |    |          |                                  | .               |
| Maximum Concentration |                  |                 | 26.0    |    |          |                                  |                 |
| Minimum Concentration |                  |                 | 3.00    |    |          |                                  |                 |
| Cohen or Unrevised    |                  |                 | C       |    |          |                                  |                 |
| Mean                  | .                | .               | 12.4599 |    |          |                                  |                 |
| Standard Deviation    | .                | .               | 5.1094  | .  |          | .                                | .               |
| Sample Size           |                  |                 | 6       |    |          |                                  |                 |
| Percent Detected      |                  |                 | 83.3    |    |          |                                  |                 |
| Classification Method |                  |                 | -       |    |          |                                  |                 |

\*=Normal or log normal data distributions were assumed. All statistics presented are untransformed (antilog) values. U=Concentration below detection limit H=MANOVA  
.=Value not computed C=Cohen revised statistics UN=Unrevised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table 5-29  
Statistics for Dissolved Radiochemical Concentrations in  
Background Weathered Claystone Ground Water Samples  
(Concentration units pCi/l)

|                       | Am241  | Cs137  | Alpha   | Beta    | Pu239  | Ra226  | Ra228  | Sr90   | Tritium  | U233,234 | U235   | U238   |
|-----------------------|--------|--------|---------|---------|--------|--------|--------|--------|----------|----------|--------|--------|
| Normal or Log Normal* | Normal | Normal | Normal  | Normal  | Normal | Normal | Normal | Normal | Normal   | Normal   | Normal | Normal |
| Upper Tolerance Limit | 0.0347 | 0.5916 | 24.9838 | 13.2977 | 0.0305 | .      | .      | 0.6422 | 291.8227 | .        | 0.3693 | 5.2006 |
| Lower Tolerance Limit | .      | .      | .       | .       | .      | .      | .      | .      | .        | .        | .      | .      |
| Maximum Concentration | 0.034  | 0.4    | 24.0    | 12.0    | 0.03   | 0.7    | 0.7    | 0.44   | 300.0    | 0.28     | 0.28   | 4.68   |
| Minimum Concentration | 0.0    | -0.2   | 0.0     | 2.2     | 0.0    | 0.29   | 0.29   | -0.3   | -100.0   | 0.0      | 0.0    | 0.4    |
| Cohen or Unrevised    | UN     | UN     | UN      | UN      | UN     | UN     | UN     | UN     | UN       | UN       | UN     | UN     |
| Mean                  | 0.0034 | 0.1046 | 7.7000  | 5.4846  | 0.0044 | 0.4817 | 0.4817 | 0.0462 | 40.8421  | 0.1140   | 0.1140 | 1.9533 |
| Standard Deviation    | 0.0108 | 0.1824 | 6.4721  | 2.9257  | 0.0093 | 0.1497 | 0.1497 | 0.2332 | 103.5810 | 0.0995   | 0.0995 | 1.2655 |
| Sample Size           | 10     | 13     | 13      | 13      | 11     | 6      | 6      | 13     | 19       | 15       | 15     | 15     |
| Percent Detected      | 100.0  | 100.0  | 100.0   | 100.0   | 100.0  | 100.0  | 100.0  | 100.0  | 100.0    | 100.0    | 100.0  | 100.0  |
| Classification Method | KA     | A      | KA      | KA      | KA     | KA     | KA     | KA     | A        | KA       | KA     | KA     |

\*=Normal or log normal data distributions were assumed. All statistics presented are unrevised (antilog) values U=Concentration below detection limit H=MANOVA  
.=Value not computed C=Cohen revised statistics UN=Unrevised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table 5-30  
Statistics for Dissolved Metal Concentrations in  
Background Weathered Sandstone Ground Water Samples  
(Concentration Units mg/l)

|                       | Al     | Sb     | As     | Ba     | Be     | Cd     | Ca      | Cs     | Cr     | Co     | Cu     | Fe     | Pb     | Li     |
|-----------------------|--------|--------|--------|--------|--------|--------|---------|--------|--------|--------|--------|--------|--------|--------|
| Normal or Log Normal* | Normal | Normal | Normal | Normal | Normal | Normal | Log     | Normal | Normal | Normal | Normal | Normal | Normal | Normal |
| Upper Tolerance Limit | .      | .      | .      | .      | .      | .      | .       | .      | .      | .      | .      | .      | .      | .      |
| Lower Tolerance Limit | .      | .      | .      | .      | .      | .      | .       | .      | .      | .      | .      | .      | .      | .      |
| Maximum Concentration | 0.20   | 0.176  | 0.010  | 0.20   | 0.0050 | 0.0050 | 65.7    | 2.50   | 0.0122 | 0.050  | 0.0250 | 0.10   | 0.0050 | 1.79   |
| Minimum Concentration | 0.20   | 0.060  | 0.010  | 0.20   | 0.0050 | 0.0050 | 30.9    | 1.00   | 0.010  | 0.050  | 0.0250 | 0.10   | 0.0050 | 0.0106 |
| Cohen or Unrevised    | UN     | UN     | UN     | UN     | UN     | UN     | UN      | UN     | UN     | UN     | UN     | UN     | UN     | UN     |
| Mean                  | 0.1000 | 0.0665 | 0.0050 | 0.1000 | 0.0025 | 0.0025 | 46.0332 | 0.6250 | 0.0064 | 0.0250 | 0.0125 | 0.0500 | 0.0025 | 0.3334 |
| Standard Deviation    | 0.0000 | 0.0730 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 5.8860  | 0.3062 | 0.0032 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.7137 |
| Sample Size           | 6      | 4      | 4      | 5      | 4      | 5      | 6       | 6      | 5      | 5      | 5      | 6      | 5      | 6      |
| Percent Detected      | 0.0    | 25.0   | 0.0    | 0.0    | 0.0    | 0.0    | 100.0   | 0.0    | 20.0   | 0.0    | 0.0    | 0.0    | 0.0    | 33.3   |
| Classification Method | KA     | KA     | KA     | KA     | KA     | KA     | KA      | A      | KA     | KA     | KA     | KA     | KA     | KA     |

|                       | Hg     | Mn     | Hg      | Mo     | Ni     | K      | Se     | Ag     | Na      | Sr     | Tl     | Sn     | V      | Zn     |
|-----------------------|--------|--------|---------|--------|--------|--------|--------|--------|---------|--------|--------|--------|--------|--------|
| Normal or Log Normal* | Log    | Log    | Normal  | Normal | Normal | Normal | Normal | Normal | Log     | Normal | Normal | Normal | Normal | Normal |
| Upper Tolerance Limit | .      | .      | .       | .      | .      | .      | .      | .      | .       | .      | .      | .      | .      | .      |
| Lower Tolerance Limit | .      | .      | .       | .      | .      | .      | .      | .      | .       | .      | .      | .      | .      | .      |
| Maximum Concentration | 9.41   | 0.292  | 0.00020 | 0.10   | 0.040  | 10.2   | 0.0050 | 0.010  | 25.6    | 2.03   | 0.050  | 0.10   | 0.050  | 0.0258 |
| Minimum Concentration | 5.25   | 0.0150 | 0.00020 | 0.015  | 0.040  | 5.00   | 0.0050 | 0.010  | 12.6    | 0.288  | 0.010  | 0.10   | 0.050  | 0.020  |
| Cohen or Unrevised    | UN     | C      | UN      | UN     | UN     | UN     | UN     | UN     | UN      | UN     | UN     | UN     | UN     | UN     |
| Mean                  | 7.3261 | 0.1124 | 0.0001  | 0.042  | 0.0200 | 4.0400 | 0.0025 | 0.0050 | 20.4354 | 0.7197 | 0.0083 | 0.0500 | 0.0250 | 0.0126 |
| Standard Deviation    | 0.7506 | 0.0722 | 0.0000  | 0.0143 | 0.0000 | 3.4435 | 0.0000 | 0.0000 | 2.6519  | 0.6475 | 0.0082 | 0.0000 | 0.0000 | 0.0065 |
| Sample Size           | 6      | 6      | 5       | 6      | 6      | 5      | 4      | 5      | 6       | 6      | 6      | 6      | 6      | 6      |
| Percent Detected      | 100.0  | 83.3   | 0.0     | 16.7   | 0.0    | 20.0   | 0.0    | 0.0    | 100.0   | 33.3   | 0.0    | 0.0    | 0.0    | 16.7   |
| Classification Method | KA     | KA     | KA      | KA     | KA     | KA     | KA     | KA     | KA      | KA     | KA     | KA     | KA     | KA     |

\*=Normal or log normal data distributions were assumed. All statistics presented are untransformed (antilog) values. U=Concentration below detection limit M=MANOVA  
 =Value not computed C=Cohen revised statistics UN=Unrevised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table 5-31

Statistics for Inorganic Concentrations in  
Background Weathered Sandstone Ground Water Samples  
(Concentration units mg/l except pH)

|                       | HCO3     | CO3    | Cl | CN      | Field pH | NO3/NO2 | SO4     |
|-----------------------|----------|--------|----|---------|----------|---------|---------|
| Normal or Log Normal* | Log      | Normal |    | Normal  | Normal   | Log     | Log     |
| Upper Tolerance Limit | 236.8072 | .      | .  | .       | 8.8076   | 2.1648  | 39.1245 |
| Lower Tolerance Limit | .        | .      | .  | .       | 5.6674   | .       | .       |
| Maximum Concentration | 240.0    | 5.00   |    | 0.01U   | 8.4      | 1.6     | 48.0    |
| Minimum Concentration | 130.0    | 5.00   |    | 0.0025U | 6.9      | 0.18    | 13.0    |
| Cohen or Unrevised    | UN       | UN     |    | UN      | UN       | UN      | UN      |
| Mean                  | 175.5991 | 2.5000 |    | 0.0025  | 7.2375   | 0.9473  | 23.7154 |
| Standard Deviation    | 18.0052  | 0.0000 |    | 0.0019  | 0.4926   | 0.3581  | 4.5328  |
| Sample Size           | 7        | 7      |    | 6       | 8        | 7       | 7       |
| Percent Detected      | 100.0    | 0.0    |    | 0.0     | 100.0    | 100.0   | 100.0   |

Classification Method

- - - - -

\*=Normal or log normal data distributions were assumed All statistics presented are untransformed (antilog) values. U=Concentration below detection limit M=MANOVA  
.=Value not computed C=Cohen revised statistics UN=UNrevised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table S-32  
Statistics for Inorganic Concentrations in  
Background South Rocky Flats Weathered Sandstone Ground Water Samples  
(Concentration units mg/l except pH)

|                       | HCO3 | CO3 | Cl      | CN | Field pH | NO3/NO2 | SO4 |
|-----------------------|------|-----|---------|----|----------|---------|-----|
| Normal or Log Normal* |      |     |         |    |          |         |     |
| Upper Tolerance Limit | .    | .   | 17.2107 | .  | .        | .       | .   |
| Lower Tolerance Limit |      |     | .       | .  | .        | .       | .   |
| Maximum Concentration |      |     | 18.0    |    |          |         |     |
| Minimum Concentration |      |     | 6.0     |    |          |         |     |
| Cohen or Unrevised    |      |     | UN      |    |          |         |     |
| Mean                  | .    | .   | 10.2500 | .  | .        | .       | .   |
| Standard Deviation    | .    | .   | 2.0476  | .  | .        | .       | .   |
| Sample Size           |      |     | 7       |    |          |         |     |
| Percent Detected      |      |     | 100.0   |    |          |         |     |
| Classification Method |      |     | -       |    |          |         |     |

\*=Normal or log normal data distributions were assumed. All statistics presented are untransformed (antilog) values. U=Concentration below detection limit M=MANOVA  
.=Value not computed C=Cohen revised statistics UN=Unrevised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table 5-33  
Statistics for Dissolved Radiochemical Concentrations in  
Background Weathered Sandstone Ground Water Samples  
(Concentration units pCi/l)

|                       | Am241  | Cs137   | Alpha   | Beta   | Pu239  | Ra226  | Ra228  | Sr90   | Iritium  | U233, 234 | U235   | U238   |
|-----------------------|--------|---------|---------|--------|--------|--------|--------|--------|----------|-----------|--------|--------|
| Normal or Log Normal* | Normal | Normal  | Normal  | Normal | Normal | Normal | Normal | Normal | Normal   | Normal    | Normal | Normal |
| Upper Tolerance Limit | 0.0263 | 0.9777  | 12 7000 | 5.6214 | 0.0159 |        |        | 0 9394 | 235 1185 |           | 0 2170 | 1 0706 |
| Lower Tolerance Limit |        |         |         |        |        |        |        |        |          |           |        |        |
| Maximum Concentration | 0.016  | 0.3     | 8 0     | 4.0    | 0 01   | 0.4    |        | 0.52   | 100.0    |           | 0 13   | 0 62   |
| Minimum Concentration | 0.0    | -0.5    | 0 7     | 0.0    | 0.0    | 0.3    |        | -0.2   | -100.0   |           | -0 07  | 0 1    |
| Cohen or Unrevised    | UN     | UN      | UN      | UN     | UN     | UN     |        | UN     | UN       |           | UN     | UN     |
| Mean                  | 0.0046 | -0.0313 | 3.9125  | 1.9250 | 0 0030 | 0.3667 |        | 0 1125 | 1.2500   |           | 0.0188 | 0 3500 |
| Standard Deviation    | 0.0064 | 0.3166  | 2.7570  | 1.1597 | 0.0040 | 0.0577 |        | 0.2594 | 73 3753  |           | 0 0622 | 0 2261 |
| Sample Size           | 7      | 8       | 8       | 8      | 8      | 3      |        | 8      | 8        |           | 8      | 8      |
| Percent Detected      | 100.0  | 100.0   | 100.0   | 100.0  | 100.0  | 100.0  |        | 100.0  | 100 0    |           | 100 0  | 100 0  |
| Classification Method | KA     | A       | KA      | KA     | KA     | -      |        | KA     | A        |           | KA     | KA     |

\*=Normal or log normal data distributions were assumed. All statistics presented are untransformed (antilog) values. U=Concentration below detection limit M=MANOVA  
.=Value not computed C=Cohen revised statistics UN=UNrevised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table 5-34  
Statistics for Dissolved Metal Concentrations in  
Background Unweathered Sandstone Ground Water Samples  
(Concentration units mg/l)

|                       | Al     | Sb     | As     | Ba     | Be     | Cd      | Ca      | Cs     | Cr     | Co     | Cu     | Fe     | Pb     | L1     |
|-----------------------|--------|--------|--------|--------|--------|---------|---------|--------|--------|--------|--------|--------|--------|--------|
| Normal or Log Normal* | Normal | Normal | Normal | Normal | Normal | Normal  | Log     | Normal | Normal | Normal | Normal | Normal | Normal | Normal |
| Upper Tolerance Limit | .      | .      | .      | .      | .      | 38 8630 | .       | .      | .      | .      | .      | .      | .      | .      |
| Lower Tolerance Limit | .      | .      | .      | .      | .      | .       | .       | .      | .      | .      | .      | .      | .      | .      |
| Maximum Concentration | 0.327  | 0.50   | 0.0186 | 0.20   | 0.0050 | 0.0050  | 99.3    | 2.50   | 0.0177 | 0.050  | 0.0695 | 0.0539 | 0.024  | 0.283  |
| Minimum Concentration | 0.030  | 0.060  | 0.0020 | 0.050  | 0.0020 | 0.0040  | 5.00    | 0.10   | 0.010  | 0.020  | 0.020  | 0.0336 | 0.0020 | 0.024  |
| Cohen or Unrevised    | UN     | UN     | UN     | UN     | UN     | UN      | UN      | UN     | UN     | UN     | UN     | UN     | UN     | UN     |
| Mean                  | 0.1109 | 0.0647 | 0.0055 | 0.0947 | 0.0023 | 0.0024  | 24.4479 | 0.4925 | 0.0067 | 0.0228 | 0.0166 | 0.0489 | 0.0055 | 0.0624 |
| Standard Deviation    | 0.0690 | 0.0824 | 0.0036 | 0.0171 | 0.0006 | 0.0002  | 6.0163  | 0.2255 | 0.0035 | 0.0055 | 0.0140 | 0.0043 | 0.0059 | 0.0538 |
| Sample Size           | 13     | 19     | 20     | 20     | 18     | 17      | 20      | 20     | 16     | 20     | 19     | 19     | 20     | 20     |
| Percent Detected      | 7.7    | 0.0    | 15.0   | 10.0   | 0.0    | 0.0     | 90.0    | 0.0    | 6.3    | 0.0    | 10.5   | 15.8   | 10.0   | 25.0   |
| Classification Method | KA     | KA     | KA     | KA     | KA     | KA      | KA      | A      | KA     | KA     | KA     | KA     | KA     | KA     |

|                       | Hg     | Mn     | Hg      | Mo     | Ni     | K      | Se     | Ag     | Na       | Sr     | Tl     | Sn     | V      | Zn     |
|-----------------------|--------|--------|---------|--------|--------|--------|--------|--------|----------|--------|--------|--------|--------|--------|
| Normal or Log Normal* | Log    | Log    | Normal  | Normal | Normal | Normal | Normal | Normal | Log      | Normal | Normal | Normal | Normal | Normal |
| Upper Tolerance Limit | .      | .      | .       | .      | .      | .      | .      | .      | 213 3108 | .      | .      | .      | .      | 0 2582 |
| Lower Tolerance Limit | .      | .      | .       | .      | .      | .      | .      | .      | .        | .      | .      | .      | .      | .      |
| Maximum Concentration | 35.0   | 0.0774 | 0.0003  | 0.50   | 0.040  | 21.9   | 0.041  | 0.030  | 454.0    | 1.43   | 0.040  | 1.00   | 0.050  | 0.374  |
| Minimum Concentration | 1.91   | 0.010  | 0.00020 | 0.10   | 0.020  | 5.00   | 0.0020 | 0.010  | 61.7     | 0.139  | 0.0030 | 0.10   | 0.010  | 0.020  |
| Cohen or Unrevised    | UN     | UN     | UN      | UN     | UN     | UN     | UN     | UN     | UN       | UN     | UN     | UN     | UN     | UN     |
| Mean                  | 4.2178 | 0.0167 | 0.0001  | 0.0859 | 0.0182 | 5.9247 | 0.0062 | 0.0066 | 155 9665 | 0.5658 | 0.0063 | 0.1175 | 0.0215 | 0.0440 |
| Standard Deviation    | 0.7074 | 0.0035 | 0.0001  | 0.0730 | 0.0039 | 6.0886 | 0.0094 | 0.0037 | 23 9334  | 0.2773 | 0.0050 | 0.1649 | 0.0079 | 0.0861 |
| Sample Size           | 20     | 19     | 19      | 20     | 17     | 19     | 19     | 19     | 20       | 20     | 19     | 20     | 17     | 17     |
| Percent Detected      | 35.0   | 31.6   | 26.3    | 10.0   | 0.0    | 47.4   | 31.6   | 0.0    | 100.0    | 40.0   | 0.0    | 0.0    | 0.0    | 58.8   |
| Classification Method | KA     | KA     | KA      | KA     | KA     | KA     | KA     | KA     | KA       | KA     | KA     | KA     | KA     | KA     |

\*=Normal or log normal data distributions were assumed. All statistics presented are untransformed (antilog) values U=Concentration below detection limit M=MANOVA  
.=Value not computed C=Cohen revised statistics UN=Unrevised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table 5-35  
Statistics for Inorganic Concentrations in  
Background Unweathered Sandstone Ground Water Samples  
(Concentration units mg/l except pH)

|                       | HCO <sub>3</sub> | CO <sub>3</sub> | Cl | CM      | Field pH | NO <sub>3</sub> /NO <sub>2</sub> | SO <sub>4</sub> |
|-----------------------|------------------|-----------------|----|---------|----------|----------------------------------|-----------------|
| Normal or Log Normal* | Log              | Normal          |    | Normal  | Normal   | Log                              | Log             |
| Upper Tolerance Limit | 302.2308         | 30.1793         | .  |         | 10.6483  | .                                | 290.9021        |
| Lower Tolerance Limit |                  | .               | .  |         | 7.2917   | .                                |                 |
| Maximum Concentration | 390.0            | 25.0            |    | 0.01U   | 10.4     | 3.6                              | 670.0           |
| Minimum Concentration | 140.0            | 5.0U            |    | 0.0025U | 8.0      | 0.05U                            | 5.0U            |
| Cohen or Unrevised    | UN               | C               |    | UN      | UN       | C                                | C               |
| Mean                  | 255.6284         | 6.3774          | .  | 0.0037  | 8.9700   | 0.7294                           | 88.9962         |
| Standard Deviation    | 17.4508          | 8.9129          | .  | 0.0017  | 0.7005   | 0.6543                           | 75.6059         |
| Sample Size           | 13               | 13              |    | 11      | 20       | 12                               | 13              |
| Percent Detected      | 100.0            | 69.2            |    | 18.2    | 100.0    | 50.0                             | 61.5            |
| Classification Method | A                | -               |    | -       | KA       | -                                | -               |

\*=Normal or log normal data distributions were assumed. All statistics presented are untransformed (antilog) values U=Concentration below detection limit M=MANOVA  
.=Value not computed C=Cohen revised statistics UN=Unrevised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table 5-36  
Statistics for Inorganic Concentrations in  
Background North Rocky Flats Unweathered Sandstone Ground Water Samples  
(Concentration units mg/l except pH)

|                       | HCO3 | CO3 | Cl      | CN | Field pH | NO3/NO2 | SO4 |
|-----------------------|------|-----|---------|----|----------|---------|-----|
| Normal or Log Normal* |      |     |         |    |          |         |     |
|                       | Log  |     |         |    |          |         |     |
| Upper Tolerance Limit | .    | .   | .       | .  | .        | .       | .   |
| Lower Tolerance Limit | .    | .   | .       | .  | .        | .       | .   |
| Maximum Concentration |      |     | 230.0   |    |          |         |     |
| Minimum Concentration |      |     | 4.0     |    |          |         |     |
| Cohen or Unrevised    |      |     | UN      |    |          |         |     |
| Mean                  | .    | .   | 23.8698 | .  | .        | .       | .   |
| Standard Deviation    | .    | .   | 14.1990 | .  | .        | .       | .   |
| Sample Size           |      |     | 6       |    |          |         |     |
| Percent Detected      |      |     | 100.0   |    |          |         |     |
| Classification Method |      |     | -       |    |          |         |     |

\*=Normal or log normal data distributions were assumed. All statistics presented are untransformed (antilog) values. U=Concentration below detection limit M=MANOVA  
.=Value not computed C=Cohen revised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table 5-37

Statistics for Inorganic Concentrations in  
Background South Rocky Flats Unweathered Sandstone Ground Water Samples  
(Concentration units mg/l except pH)

|                       | HCO <sub>3</sub> | CO <sub>3</sub> | Cl       | CN | Field pH | NO <sub>3</sub> /NO <sub>2</sub> | SO <sub>4</sub> |
|-----------------------|------------------|-----------------|----------|----|----------|----------------------------------|-----------------|
| Normal or Log Normal* |                  |                 |          |    |          |                                  |                 |
|                       |                  |                 | Log      |    |          |                                  |                 |
| Upper Tolerance Limit | .                |                 | 412.3540 | .  |          | .                                | .               |
| Lower Tolerance Limit |                  |                 |          | .  |          | .                                |                 |
| Maximum Concentration |                  |                 | 260.0    |    |          |                                  |                 |
| Minimum Concentration |                  |                 | 6.0      |    |          |                                  |                 |
| Cohen or Unrevised    |                  |                 | UN       |    |          |                                  |                 |
| Mean                  |                  |                 | 159.6799 | .  |          | .                                | .               |
| Standard Deviation    |                  |                 | 74.3275  | .  | .        | .                                | .               |
| Sample Size           |                  |                 | 7        |    |          |                                  |                 |
| Percent Detected      |                  |                 | 100.0    |    |          |                                  |                 |
| Classification Method |                  |                 | -        |    |          |                                  |                 |

\*=Normal or log normal data distributions were assumed. All statistics presented are untransformed (antilog) values U=Concentration below detection limit M=MANOVA  
.=Value not computed C=Cohen revised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table 5-38  
Statistics for Dissolved Radiochemical Concentrations in  
Background Unweathered Sandstone Ground Water Samples  
(Concentration units pCi/l)

|                       | Am241  | Cs137  | Alpha   | Beta    | Pu239  | Ra226  | Ra228  | Sr90   | Iritium  | U233,234 | U235   | U238   |
|-----------------------|--------|--------|---------|---------|--------|--------|--------|--------|----------|----------|--------|--------|
| Normal or Log Normal* | Normal | Normal | Normal  | Normal  | Normal | Normal | Normal | Normal | Normal   | Normal   | Normal | Normal |
| Upper Tolerance Limit | 0.0636 | 0.8192 | 28.4866 | 33.4236 | 0.0109 | .      | .      | 0.9283 | 495 8059 | .        | 1 0681 | 7 0858 |
| Lower Tolerance Limit |        |        |         |         |        |        |        |        |          |          |        |        |
| Maximum Concentration | 0.082  | 0.85   | 38.9    | 43.8    | 0.01   | 0.6    | 1.0    | 1.0    | 340 0    |          | 1 7    | 11.59  |
| Minimum Concentration | 0.0    | -0.3   | -4.0    | 2.0     | -0.002 | 0.2    | -0.3   | -0.3   | -600 0   |          | 0.0    | -0 1   |
| Cohen or Unrevised    | UN     | UN     | UN      | UN      | UN     | UN     | UN     | UN     | UN       | UN       | UN     | UN     |
| Mean                  | 0.0091 | 0.1040 | 5.4947  | 10.0800 | 0.0023 | 0.4000 | .      | 0.1650 | -25.0000 |          | 0 1580 | 1 0135 |
| Standard Deviation    | 0.0213 | 0.2985 | 9.4889  | 9.7427  | 0.0036 | 0.2828 | .      | 0 3186 | 217 3646 | .        | 0.3799 | 2.5343 |
| Sample Size           | 15     | 20     | 19      | 20      | 19     | 2      |        | 20     | 20       |          | 20     | 20     |
| Percent Detected      | 100 0  | 100.0  | 100.0   | 100.0   | 100.0  | 100.0  |        | 100 0  | 100.0    |          | 100.0  | 100.0  |
| Classification Method | KA     | A      | KA      | KA      | KA     | -      |        | KA     | A        |          | KA     | KA     |

\*=Normal or log normal data distributions were assumed. All statistics presented are untransformed (antilog) values. U=Concentration below detection limit M=MANOVA  
.=Value not computed C=Cohen revised statistics UN=Unrevised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table 5-39  
Statistics for Dissolved Metal Concentrations in  
Background Upper Most Flow System Ground Water Samples  
(Concentration units mg/l)

|                       | Al     | Sb      | As     | Ba     | Be     | Cd     | Ca      | Cs     | Cr     | Co     | Cu     | Fe     | Pb     | L1     |
|-----------------------|--------|---------|--------|--------|--------|--------|---------|--------|--------|--------|--------|--------|--------|--------|
| Normal or Log Normal* | Normal | Normal  | Normal | Normal | Normal | Normal | Log     | Normal | Normal | Normal | Normal | Normal | Normal | Normal |
| Upper Tolerance Limit |        |         |        |        |        |        | 62.5908 |        |        |        |        |        |        |        |
| Lower Tolerance Limit |        |         |        |        |        |        |         |        |        |        |        |        |        |        |
| Maximum Concentration | 0.32   | 0.50    | 0.010  | 0.222  | 0.0050 | 0.0111 | 196.0   | 2.50   | 0.020  | 0.050  | 0.0477 | 0.944  | 0.0396 | 0.4    |
| Minimum Concentration | 0.030  | 0.02650 | 0.0010 | 0.050  | 0.0020 | 0.0040 | 17.0    | 0.0050 | 0.0090 | 0.020  | 0.0040 | 0.030  | 0.0020 | 0.004  |
| Cohen or Unrevised    | UN     | UN      | UN     | UN     | UN     | UN     | UN      | UN     | UN     | UN     | UN     | UN     | UN     | UN     |
| Mean                  | 0.0939 | 0.0560  | 0.0043 | 0.0984 | 0.0023 | 0.0027 | 55.2521 | 0.5363 | 0.0057 | 0.0229 | 0.0134 | 0.0927 | 0.0032 | 0.0551 |
| Standard Deviation    | 0.0374 | 0.0721  | 0.0015 | 0.0185 | 0.0006 | 0.0011 | 3.7224  | 0.2740 | 0.0017 | 0.0051 | 0.0067 | 0.1568 | 0.0047 | 0.0621 |
| Sample Size           | 63     | 75      | 64     | 77     | 68     | 72     | 77      | 69     | 72     | 76     | 64     | 70     | 72     | 73     |
| Percent Detected      | 14.3   | 0.0     | 3.1    | 15.6   | 0.0    | 4.2    | 100.0   | 0.0    | 1.4    | 0.0    | 6.3    | 21.4   | 11.1   | 35.6   |
| Classification Method | -      | -       | -      | -      | -      | -      | -       | -      | -      | -      | -      | -      | -      | -      |

|                       | Hg      | Mn     | Hg      | Mo     | Ni     | K      | Se     | Ag     | Na      | Sr     | Tl     | Sn     | V      | Zn     |
|-----------------------|---------|--------|---------|--------|--------|--------|--------|--------|---------|--------|--------|--------|--------|--------|
| Normal or Log Normal* | Log     | Log    | Normal  | Normal | Normal | Normal | Normal | Normal | Log     | Normal | Normal | Normal | Normal | Normal |
| Upper Tolerance Limit | 16.0851 | 0.2133 |         |        |        |        |        |        | 46.7359 |        |        |        |        |        |
| Lower Tolerance Limit |         |        |         |        |        |        |        |        |         |        |        |        |        |        |
| Maximum Concentration | 179.0   | 0.686  | 0.0008  | 0.50   | 0.0432 | 11.3   | 0.221  | 0.030  | 714.0   | 7.12   | 0.050  | 1.00   | 0.050  | 0.141  |
| Minimum Concentration | 5.00    | 0.010  | 0.00020 | 0.010  | 0.020  | 0.208  | 0.0010 | 0.0040 | 5.00    | 0.10   | 0.0010 | 0.10   | 0.010  | 0.010  |
| Cohen or Unrevised    | C       | C      | UN      | UN     | UN     | UN     | UN     | UN     | UN      | UN     | UN     | UN     | UN     | UN     |
| Mean                  | 11.9183 | 0.1124 | 0.0001  | 0.0630 | 0.0189 | 2.5977 | 0.0117 | 0.0062 | 35.6423 | 0.5461 | 0.0084 | 0.1127 | 0.0224 | 0.0250 |
| Standard Deviation    | 2.1135  | 0.0511 | 0.0001  | 0.0708 | 0.0048 | 1.5044 | 0.0366 | 0.0034 | 5.6270  | 0.7973 | 0.0072 | 0.1547 | 0.0066 | 0.0256 |
| Sample Size           | 77      | 76     | 66      | 77     | 65     | 67     | 62     | 70     | 77      | 77     | 73     | 75     | 76     | 67     |
| Percent Detected      | 75.3    | 67.1   | 10.6    | 5.2    | 3.1    | 19.4   | 16.1   | 0.0    | 97.4    | 31.2   | 1.4    | 0.0    | 0.0    | 46.3   |
| Classification Method | -       | -      | -       | -      | -      | -      | -      | -      | -       | -      | -      | -      | -      | -      |

\*=Normal or log normal data distributions were assumed. All statistics presented are untransformed (antilog) values. U=Concentration below detection limit N=ANOVA  
.=Value not computed C=Cohen revised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table 5-40  
Statistics for Dissolved Metal Concentrations in  
Background Lower Most Flow System Ground Water Samples  
(Concentration Units mg/l)

|                       | Al     | Sb     | As     | Ba     | Be     | Cd     | Ca      | Cs     | Cr     | Co     | Cu     | Fe     | Pb     | L1     |
|-----------------------|--------|--------|--------|--------|--------|--------|---------|--------|--------|--------|--------|--------|--------|--------|
| Normal or Log Normal* | Normal | Normal | Normal | Normal | Normal | Normal | Log     | Normal | Normal | Normal | Normal | Normal | Normal | Normal |
| Upper Tolerance Limit | .      | .      | .      | .      | .      | .      | 49 2824 | .      | .      | .      | .      | .      | .      | .      |
| Lower Tolerance Limit | .      | .      | .      | .      | .      | .      | .       | .      | .      | .      | .      | .      | .      | .      |
| Maximum Concentration | 0.327  | 0.50   | 0.0186 | 0.20   | 0.0050 | 0.0050 | 167.0   | 2.50   | 0.0177 | 0.050  | 0.0695 | 0.0539 | 0.024  | 1.79   |
| Minimum Concentration | 0.030  | 0.060  | 0.0020 | 0.050  | 0.0020 | 0.0040 | 5.00    | 0.10   | 0.010  | 0.020  | 0.020  | 0.0336 | 0.0020 | 0.024  |
| Cohen or Unrevised    | UN     | UN     | UN     | UN     | UN     | UN     | UN      | UN     | UN     | UN     | UN     | UN     | UN     | UN     |
| Mean                  | 0.1084 | 0.0666 | 0.0055 | 0.0954 | 0.0023 | 0.0024 | 31.4982 | 0.4937 | 0.0068 | 0.0230 | 0.0161 | 0.0491 | 0.0050 | 0.1422 |
| Standard Deviation    | 0.0600 | 0.0808 | 0.0033 | 0.0160 | 0.0005 | 0.0002 | 7.7011  | 0.2050 | 0.0035 | 0.0052 | 0.0130 | 0.0039 | 0.0055 | 0.3571 |
| Sample Size           | 17     | 22     | 23     | 23     | 21     | 20     | 24      | 24     | 19     | 23     | 22     | 23     | 24     | 24     |
| Percent Detected      | 5.9    | 4.5    | 13.0   | 8.7    | 0.0    | 0.0    | 91.7    | 0.0    | 10.5   | 0.0    | 9.1    | 13.0   | 8.3    | 29.2   |
| Classification Method | -      | -      | -      | -      | -      | -      | -       | -      | -      | -      | -      | -      | -      | -      |

|                       | Mg     | Mn     | Hg      | Mo     | Ni     | K      | Se     | Ag     | Na       | Sr     | Tl     | Sn     | V      | Zn     |
|-----------------------|--------|--------|---------|--------|--------|--------|--------|--------|----------|--------|--------|--------|--------|--------|
| Normal or Log Normal* | Log    | Log    | Normal  | Normal | Normal | Normal | Normal | Normal | Log      | Normal | Normal | Normal | Normal | Normal |
| Upper Tolerance Limit | .      | .      | .       | .      | .      | .      | .      | .      | 231.8338 | .      | .      | .      | .      | 0.2234 |
| Lower Tolerance Limit | .      | .      | .       | .      | .      | .      | .      | .      | .        | .      | .      | .      | .      | .      |
| Maximum Concentration | 45.7   | 0.846  | 0.0003  | 0.50   | 0.040  | 21.9   | 0.041  | 0.030  | 454.0    | 2.03   | 0.040  | 1.00   | 0.050  | 0.374  |
| Minimum Concentration | 1.91   | 0.010  | 0.00020 | 0.10   | 0.020  | 5.00   | 0.0020 | 0.010  | 12.6     | 0.139  | 0.0030 | 0.10   | 0.010  | 0.020  |
| Cohen or Unrevised    | UN     | UN     | UN      | UN     | UN     | UN     | UN     | UN     | UN       | UN     | UN     | UN     | UN     | UN     |
| Mean                  | 5.5813 | 0.0281 | 0.0001  | 0.0799 | 0.0185 | 5.7861 | 0.0055 | 0.0063 | 154.0768 | 0.6460 | 0.0061 | 0.1062 | 0.0221 | 0.0383 |
| Standard Deviation    | 1.0610 | 0.0082 | 0.0001  | 0.0677 | 0.0037 | 5.6767 | 0.0086 | 0.0034 | 33.6713  | 0.4071 | 0.0045 | 0.1520 | 0.0072 | 0.0781 |
| Sample Size           | 24     | 23     | 23      | 24     | 20     | 23     | 23     | 23     | 24       | 24     | 23     | 24     | 21     | 21     |
| Percent Detected      | 45.8   | 39.1   | 21.7    | 8.3    | 0.0    | 47.8   | 26.1   | 0.0    | 100.0    | 41.7   | 0.0    | 0.0    | 0.0    | 52.4   |
| Classification Method | -      | -      | -       | -      | -      | -      | -      | -      | -        | -      | -      | -      | -      | -      |

\*=Normal or log normal data distributions were assumed. All statistics presented are untransformed (antilog) values. U=Concentration below detection limit M=MANOVA  
 .=Value not computed C=Cohen revised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table 5-41  
Statistics for Inorganic Concentrations in  
Background Upper Most Flow System Ground Water Samples  
(Concentration units mg/l except pH)

|                       | HCO3     | CO3    | Cl | CN      | Field pH | NO3/NO2 | SO4     |
|-----------------------|----------|--------|----|---------|----------|---------|---------|
| Normal or Log Normal* | Log      | Normal |    | Normal  | Normal   | Log     | Log     |
| Upper Tolerance Limit | 249.3524 | .      | .  | .       | 8.2190   | 3.4338  | 67.0794 |
| Lower Tolerance Limit |          | .      |    | .       | 6.3897   | .       | .       |
| Maximum Concentration | 680.0    | 5.0U   |    | 0.01U   | 8.6      | 6.5     | 1800.0  |
| Minimum Concentration | 56.0     | 5.0U   |    | 0.0025U | 6.3      | 0.05U   | 10.0    |
| Cohen or Unrevised    | UN       | UN     |    | UN      | UN       | C       | UN      |
| Mean                  | 218.0855 | 2.5000 |    | 0.0030  | 7.3043   | 1.7810  | 54.2917 |
| Standard Deviation    | 15.9527  | 0.0000 |    | 0.0018  | 0.4715   | 0.8404  | 6.5244  |
| Sample Size           | 82       | 81     |    | 67      | 92       | 79      | 82      |
| Percent Detected      | 100.0    | 0.0    |    | 4.5     | 100.0    | 83.5    | 100.0   |
| Classification Method | -        | -      |    | -       | -        | -       | -       |

\*=Normal or log normal data distributions were assumed. All statistics presented are untransformed (antilog) values. U=Concentration below detection limit M=MANOVA  
.=Value not computed C=Cohen revised statistics UN=Unrevised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table 5-42  
Statistics for Inorganic Concentrations in  
Background Lower Most Flow System Ground Water Samples  
(Concentration units mg/l except pH)

|                       | HCO3     | CO3     | Cl | CM      | Field pH | NO3/NO2 | SO4      |
|-----------------------|----------|---------|----|---------|----------|---------|----------|
| Normal or Log Normal* | Log      | Normal  |    | Normal  | Normal   | Log     | Log      |
| Upper Tolerance Limit | 274.7981 | 28.6813 |    | .       | 10 9077  | 6.4068  | 153.7200 |
| Lower Tolerance Limit | .        | .       |    | .       | 6 2443   |         |          |
| Maximum Concentration | 390.0    | 25.0    |    | 0.01U   | 10 4     | 3 6     | 670.0    |
| Minimum Concentration | 130.0    | 5.0U    |    | 0.0025U | 7.0      | 0.05U   | 5.0U     |
| Cohen or Unrevised    | UM       | C       |    | UM      | UM       | C       | C        |
| Mean                  | 228.0014 | 3.4396  | .  | 0.0035  | 8.5760   | 2.0070  | 57 0920  |
| Standard Deviation    | 18.8221  | 10.1525 | .  | 0.0018  | 1.0175   | 1.7696  | 38.8647  |
| Sample Size           | 17       | 17      |    | 15      | 25       | 17      | 17       |
| Percent Detected      | 100 0    | 52.9    |    | 13 3    | 100.0    | 58 8    | 70.6     |
| Classification Method | -        | -       |    | -       | -        | -       | -        |

\*=Normal or log normal data distributions were assumed. All statistics presented are untransformed (antilog) values. U=Concentration below detection limit N=MANOVA  
.=Value not computed C=Cohen revised statistics UM=Unrevised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table 5-43  
Statistics for Inorganic Concentrations in  
Background North Rocky Flats Upper Most Flow System Ground Water Samples  
(Concentration units mg/l except pH)

|                       | HCO3 | CO3 | Cl      | CM | Field pH | NO3/NO2 | SO4 |
|-----------------------|------|-----|---------|----|----------|---------|-----|
| Normal or Log Normal* |      |     |         |    |          |         |     |
| Upper Tolerance Limit |      |     | Log     |    |          |         |     |
| Lower Tolerance Limit |      |     | 10 6716 |    |          |         |     |
| Maximum Concentration |      |     | 28 0    |    |          |         |     |
| Minimum Concentration |      |     | 3 00    |    |          |         |     |
| Cohen or Unrevised    |      |     | C       |    |          |         |     |
| Mean                  |      |     | 7 9398  |    |          |         |     |
| Standard Deviation    |      |     | 1 2807  |    |          |         |     |
| Sample Size           |      |     | 39      |    |          |         |     |
| Percent Detected      |      |     | 84 6    |    |          |         |     |
| Classification Method |      |     | -       |    |          |         |     |

\*=Normal or log normal data distributions were assumed. All statistics presented are untransformed (antilog) values U=Concentration below detection limit H=MANOVA  
.=Value not computed C=Cohen revised statistics UN=Unrevised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table 5-44  
Statistics for Inorganic Concentrations in  
Background North Rocky Flats Lower Most Flow System Ground Water Samples  
(Concentration units mg/l except pH)

|                       | HCO3 | CO3 | Cl      | CN | Field pH | NO3/NO2 | SO4 |
|-----------------------|------|-----|---------|----|----------|---------|-----|
| Normal or Log Normal* |      |     |         |    |          |         |     |
|                       |      |     |         |    | Log      |         |     |
| Upper Tolerance Limit | .    | .   | .       | .  | .        | .       | .   |
| Lower Tolerance Limit | .    | .   | .       | .  | .        | .       | .   |
| Maximum Concentration |      |     | 230.0   |    |          |         |     |
| Minimum Concentration |      |     | 4.0     |    |          |         |     |
| Cohen or Unrevised    |      |     | UN      |    |          |         |     |
| Mean                  |      |     | 23.8698 | .  | .        | .       | .   |
| Standard Deviation    |      |     | 14.1990 | .  | .        | .       | .   |
| Sample Size           |      |     | 6       |    |          |         |     |
| Percent Detected      |      |     | 100.0   |    |          |         |     |
| Classification Method |      |     |         |    |          |         |     |

\*=Normal or log normal data distributions were assumed. All statistics presented are untransformed (antilog) values. U=Concentration below detection limit M=MANOVA  
.=Value not computed C=Cohen revised statistics UN=Unrevised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table 5-45  
Statistics for Inorganic Concentrations in  
Background South Rocky Flats Upper Most Flow System Ground Water Samples  
(Concentration units mg/l except pH)

|                       | HC03 | CO3 | Cl      | CN | Field pH | NO3/NO2 | SO4 |
|-----------------------|------|-----|---------|----|----------|---------|-----|
| Normal or Log Normal* |      |     |         |    |          |         |     |
| Upper Tolerance Limit | .    | .   | 21.9777 | .  | .        | .       | .   |
| Lower Tolerance Limit | .    | .   |         | .  | .        | .       | .   |
| Maximum Concentration |      |     | 160.0   |    |          |         |     |
| Minimum Concentration |      |     | 3.00    |    |          |         |     |
| Cohen or Unrevised    |      |     | UN      |    |          |         |     |
| Mean                  | .    | .   | 15.8927 | .  | .        | .       | .   |
| Standard Deviation    | .    | .   | 2.8910  | .  | .        | .       | .   |
| Sample Size           |      |     | 43      |    |          |         |     |
| Percent Detected      |      |     | 88.4    |    |          |         |     |
| Classification Method |      |     | -       |    |          |         |     |

\*=Normal or log normal data distributions were assumed. All statistics presented are untransformed (antilog) values. U=Concentration below detection limit M=MANOVA  
.=Value not computed C=Cohen revised statistics UN=Unrevised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table 5-46  
Statistics for Inorganic Concentrations in  
Background South Rocky Flats Lower Most Flow System Ground Water Samples  
(Concentration units mg/l except pH)

|                       | HCO3 | CO3 | Cl       | CN | Field pH | NO3/NO2 | SO4 |
|-----------------------|------|-----|----------|----|----------|---------|-----|
| Normal or Log Normal* |      |     |          |    |          |         |     |
|                       |      |     | Log      |    |          |         |     |
| Upper Tolerance Limit |      |     | 259 1303 |    | .        |         | .   |
| Lower Tolerance Limit |      |     |          |    | .        |         |     |
| Maximum Concentration |      |     | 260 0    |    |          |         |     |
| Minimum Concentration |      |     | 6 0      |    |          |         |     |
| Cohen or Unrevised    |      |     | UN       |    |          |         |     |
| Mean                  | .    | .   | 102 2999 |    | .        | .       | .   |
| Standard Deviation    | .    | .   | 55 7125  |    | .        | .       | .   |
| Sample Size           |      |     | 11       |    |          |         |     |
| Percent Detected      |      |     | 100 0    |    |          |         |     |
| Classification Method |      |     |          |    |          |         |     |

\*=Normal or log normal data distributions were assumed. All statistics presented are untransformed (antilog) values U=Concentration below detection limit H=MANOVA  
.=Value not computed C=Cohen revised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table 5-47  
Statistics for Dissolved Radiochemical Concentrations in  
Background Upper Most Flow System Ground Water Samples  
(Concentration units pCi/l)

|                       | Am241  | Cs137  | Alpha   | Beta    | Pu239  | Ra226   | Ra228  | Sr90   | Iritium  | U233,234 | U235   | U238    |
|-----------------------|--------|--------|---------|---------|--------|---------|--------|--------|----------|----------|--------|---------|
| Normal or Log Normal* | Normal | Normal | Normal  | Normal  | Normal | Normal  | Normal | Normal | Normal   | Normal   | Normal | Normal  |
| Upper Tolerance Limit | 0.0167 | 0.5061 | 55.0708 | 59.6331 | 0.0150 | 96.2939 | .      | 0.9004 | 359.0676 | .        | 2.0862 | 25.5702 |
| Lower Tolerance Limit |        | .      | .       | .       | .      | .       | .      | .      | .        | .        | .      | .       |
| Maximum Concentration | 0.034  | 0.5    | 200.0   | 220.0   | 0.03   | 170.0   |        | 2.13   | 430.0    | 0.1      | 7.74   | 76.9    |
| Minimum Concentration | -0.01  | -0.6   | -1.0    | -1.0    | 0.0    | -0.1    |        | -0.7   | -370.0   | 0.1      | -0.08  | -0.1    |
| Cohen or Unrevised    | UN     | UN     | UN      | UN      | UN     | UN      |        | UN     | UN       | UN       | UN     | UN      |
| Mean                  | 0.0013 | 0.0527 | 7.7260  | 8.1507  | 0.0027 | 8.5674  |        | 0.1390 | 73.3247  | 0.1000   | 0.2184 | 3.1653  |
| Standard Deviation    | 0.0076 | 0.2288 | 23.8918 | 25.9798 | 0.0061 | 36.9932 | .      | 0.3842 | 144.9376 |          | 0.9450 | 11.3359 |
| Sample Size           | 59     | 73     | 73      | 73      | 67     | 21      |        | 73     | 77       | 1        | 75     | 75      |
| Percent Detected      | 100.0  | 100.0  | 100.0   | 100.0   | 100.0  | 100.0   |        | 100.0  | 100.0    | 100.0    | 100.0  | 100.0   |
| Classification Method | KA     | A      | KA      | KA      | KA     | KA      |        | KA     | A        | -        | KA     | KA      |

\*=Normal or log normal data distributions were assumed. All statistics presented are unrevised (antilog) values. U=Concentration below detection limit H=HANOVA  
.=Value not computed C=Cohen revised statistics UN=Unrevised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table 5-48  
Statistics for Dissolved Radiochemical Concentrations in  
Background Lower Most Flow System Ground Water Samples  
(Concentration units pCi/l)

|                       | Am241  | Cs137  | Alpha   | Beta    | Pu239  | Ra226  | Ra228  | Sr90   | Tritium  | U233,234 | U235   | U238   |
|-----------------------|--------|--------|---------|---------|--------|--------|--------|--------|----------|----------|--------|--------|
| Normal or Log Normal* | Normal | Normal | Normal  | Normal  | Normal | Normal | Normal | Normal | Normal   | Normal   | Normal | Normal |
| Upper Tolerance Limit | 0.0556 | 0 7837 | 25.3930 | 30 4997 | 0.0113 |        |        | 0 8554 | 420.4114 |          | 0 9438 | 6.2485 |
| Lower Tolerance Limit |        |        |         |         |        |        |        |        |          |          |        |        |
| Maximum Concentration | 0.082  | 0 85   | 38.9    | 43 8    | 0.01   | 0 6    |        | 1.0    | 340 0    |          | 1 7    | 11 59  |
| Minimum Concentration | 0.0    | -0 5   | -4.0    | 0.0     | -0.002 | 0 2    |        | -0.3   | -600.0   |          | 0 0    | -0.1   |
| Cohen or Unrevised    | UN     | UN     | UN      | UN      | UN     | UN     |        | UN     | UN       |          | UN     | UN     |
| Mean                  | 0.0076 | 0 0854 | 5.0913  | 8.6042  | 0.0026 | 0 4000 |        | 0.1508 | -17.6923 |          | 0 1371 | 0 8792 |
| Standard Deviation    | 0.0196 | 0 3024 | 8.7195  | 9.4815  | 0.0038 | 0 2000 |        | 0.3051 | 192.5473 |          | 0 3493 | 2 3251 |
| Sample Size           | 18     | 24     | 23      | 24      | 23     | 3      |        | 24     | 26       |          | 24     | 24     |
| Percent Detected      | 100.0  | 100 0  | 100.0   | 100 0   | 100.0  | 100.0  |        | 100 0  | 100.0    |          | 100 0  | 100.0  |
| Classification Method | KA     | A      | KA      | KA      | KA     | -      |        | KA     | A        |          | KA     | KA     |

\*=Normal or log normal data distributions were assumed. All statistics presented are untransformed (antilog) values. U=Concentration below detection limit M=MANOVA  
.=Value not computed C=Cohen revised statistics UN=Unrevised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table 5-49  
Statistics for Total Metal Concentrations in  
Background Surface Water Samples  
(Concentration units mg/l)

|                       | Al      | Sb     | As      | Ba     | Be     | Cd     | Ca     | Cs     | Cr     | Co     | Cu     | Fe      | Pb     | L1     |
|-----------------------|---------|--------|---------|--------|--------|--------|--------|--------|--------|--------|--------|---------|--------|--------|
| Normal or Log Normal* | Log     | Normal | Normal  | Normal | Normal | Normal | Normal | Normal | Normal | Normal | Normal | Log     | Normal |        |
| Upper Tolerance Limit | 60 4235 | .      | .       |        |        | .      | .      | .      |        |        |        | 87 1476 | .      |        |
| Lower Tolerance Limit |         |        |         |        |        |        |        |        |        |        |        |         |        |        |
| Maximum Concentration | 293 0   | 0.5U   | 1 03    | 4 49   | 0 0107 | 0.0644 |        | 2 53   | 0.275  | 0 489  | 0 607  | 3220 0  | 0.516  |        |
| Minimum Concentration | 0 0599  | 0.06U  | 0.002U  | 0.05U  | 0.002U | 0.004U |        | 0 1U   | 0 01U  | 0 02U  | 0 02U  | 0.1U    | 0 002U |        |
| Cohen or Unrevised    | C       | UN     | UN      | UN     | UN     | UN     |        | UN     | UN     | UN     | UN     | UN      | UN     |        |
| Mean                  | 20.9352 | 0 0499 | 0.0366  | 0 3942 | 0.0028 | 0.0039 |        | 0 6541 | 0.0162 | 0 0357 | 0 0328 | 33 0397 | 0 0370 | .      |
| Standard Deviation    | 19.2127 | 0 0618 | 0.1535  | 1.0031 | 0.0018 | 0.0088 |        | 0 4005 | 0.0407 | 0 0658 | 0 0854 | 26 5529 | 0 1013 |        |
| Sample Size           | 52      | 49     | 55      | 56     | 52     | 51     |        | 56     | 48     | 51     | 55     | 56      | 54     |        |
| Percent Detected      | 65 4    | 2 0    | 20.0    | 23.2   | 5.8    | 3.9    |        | 1.8    | 20 8   | 5 9    | 16 4   | 94.6    | 31 5   |        |
| Classification Method | A       | -      | P       | P      | -      | -      |        | -      | P      | -      | P      | A       | P      |        |
|                       | Hg      | Mn     | Hg      | Mo     | Ni     | K      | Se     | Ag     | Na     | Sr     | Tl     | Sn      | V      | Zn     |
| Normal or Log Normal* | Log     | Log    | Normal  | Normal | Normal | Normal | Normal | Normal | Normal | Normal | Normal | Normal  | Normal | Log    |
| Upper Tolerance Limit | 8 9377  | 1 9654 | .       | .      |        | .      |        |        |        |        |        |         |        | 0 3765 |
| Lower Tolerance Limit |         |        |         |        |        |        |        |        |        |        |        |         |        |        |
| Maximum Concentration | 28.5    | 27.7   | 0.0014  | 0.5U   | 0.646  | 10 2   | 0.025U | 0 148  |        | 1.46   | 0.05U  | 0 969   | 1 65   | 2 68   |
| Minimum Concentration | 5.0U    | 0.01U  | 0.0002U | 0.0105 | 0.02U  | 1.03   | 0 002U | 0 01U  |        | 0.1U   | 0 003U | 0 1U    | 0 01U  | 0 02U  |
| Cohen or Unrevised    | C       | C      | UN      | UN     | UN     | UN     | UN     | UN     |        | UN     | UN     | UN      | UN     | C      |
| Mean                  | 6.9461  | 0.7601 | 0.0002  | 0.0625 | 0.0394 | 2.9749 | 0 0029 | 0.0093 |        | 0 3952 | 0 0063 | 0 1100  | 0 0761 | 0 1903 |
| Standard Deviation    | 0.9774  | 0.5915 | 0.0003  | 0.0575 | 0 0982 | 1.7053 | 0.0022 | 0 0199 |        | 0 2692 | 0.0052 | 0 1808  | 0 2307 | 0 0910 |
| Sample Size           | 56      | 56     | 48      | 56     | 46     | 53     | 53     | 54     |        | 56     | 54     | 56      | 55     | 54     |
| Percent Detected      | 71.4    | 76.8   | 22.9    | 14.3   | 6 5    | 17.0   | 3.8    | 7 4    |        | 42 9   | 0 0    | 5.4     | 14 5   | 75 9   |
| Classification Method | A       | A      | P       | P      | -      | P      | -      | -      | P      | -      | -      | -       | P      | A      |

#=Normal or log normal data distributions were assumed. All statistics presented are untransformed (antilog) values. U=Cochran revised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_\_=No classification p=Test of Proportions  
 .v=Value not computed C=Cohen revised statistics UN=Unrevised statistics





Table 5-52  
Statistics for Dissolved Metal Concentrations in  
Background Surface Water Samples  
(Concentration units mg/l)

|                       | Al     | Sb     | As     | Ba     | Be     | Cd     | Ca     | Cs     | Cr     | Co     | Cu     | Fe     | Pb     | Li     |
|-----------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Normal or Log Normal* | Normal | Normal | Normal | Normal | Normal | Normal | Normal | Normal | Normal | Normal | Normal | Normal | Normal | Normal |
| Upper Tolerance Limit | .      | .      | .      | .      | .      | .      | .      | .      | .      | .      | .      | .      | .      | .      |
| Lower Tolerance Limit | .      | .      | .      | .      | .      | .      | .      | .      | .      | .      | .      | .      | .      | .      |
| Maximum Concentration | 0.485  | 0.5U   | 0.018  | 0.211  | 0.005U | 0.005U | .      | 2.5U   | 0.02U  | 0.05U  | 0.0278 | 16.7   | 0.0131 |        |
| Minimum Concentration | 0.03U  | 0.06U  | 0.002U | 0.05U  | 0.002U | 0.004U | .      | 0.1U   | 0.01U  | 0.02U  | 0.02U  | 0.1U   | 0.002U |        |
| Cohen or Unrevised    | UN     | UN     | UN     | UN     | UN     | UN     | .      | UN     | UN     | UN     | UN     | UN     | UN     | UN     |
| Mean                  | 0.1166 | 0.0473 | 0.0049 | 0.0967 | 0.0024 | 0.0025 | .      | 0.6421 | 0.0054 | 0.0244 | 0.0128 | 0.6777 | 0.0027 |        |
| Standard Deviation    | 0.0827 | 0.0597 | 0.0021 | 0.0247 | 0.0004 | 0.0001 | .      | 0.3274 | 0.0014 | 0.0029 | 0.0028 | 2.2671 | 0.0017 |        |
| Sample Size           | 48     | 51     | 54     | 57     | 50     | 53     | .      | 57     | 46     | 52     | 56     | 57     | 54     |        |
| Percent Detected      | 14.6   | 0.0    | 1.9    | 1.8    | 0.0    | 0.0    | .      | 0.0    | 0.0    | 0.0    | 3.6    | 47.4   | 11.1   |        |
| Classification Method | P      | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      | P      | P      |        |

|                       | Mg     | Mn     | Hg      | Mo     | Ni     | K      | Se     | Ag     | Na     | Sr     | Tl     | Sn     | V      | Zn     |
|-----------------------|--------|--------|---------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Normal or Log Normal* | Log    | Log    | Normal  | Normal | Normal | Normal | Normal | Normal | Normal | Normal | Normal | Normal | Normal | Normal |
| Upper Tolerance Limit | 6.4118 | 0.5096 | .       | .      | .      | .      | .      | .      | .      | .      | .      | .      | .      | .      |
| Lower Tolerance Limit | .      | .      | .       | .      | .      | .      | .      | .      | .      | .      | .      | .      | .      | .      |
| Maximum Concentration | 27.4   | 1.1    | 0.0013  | 0.5U   | 0.04U  | 2.6    | 0.0124 | 0.03U  | .      | 0.967  | 0.05U  | 1.0U   | 0.05U  | 0.102  |
| Minimum Concentration | 5.0U   | 0.01U  | 0.0002U | 0.0105 | 0.02U  | 1.18   | 0.002U | 0.01U  | .      | 0.1U   | 0.003U | 0.1U   | 0.01U  | 0.01U  |
| Cohen or Unrevised    | C      | C      | UN      | UN     | UN     | UN     | UN     | UN     | .      | UN     | UN     | UN     | UN     | UN     |
| Mean                  | 4.7569 | 0.1979 | 0.0002  | 0.0611 | 0.0191 | 2.4649 | 0.0027 | 0.0058 | .      | 0.3410 | 0.0097 | 0.0810 | 0.0236 | 0.0180 |
| Standard Deviation    | 0.8153 | 0.1530 | 0.0002  | 0.0538 | 0.0028 | 0.1986 | 0.0017 | 0.0027 | .      | 0.2010 | 0.0082 | 0.1150 | 0.0052 | 0.0185 |
| Sample Size           | 58     | 56     | 49      | 56     | 46     | 51     | 49     | 58     | .      | 58     | 57     | 58     | 57     | 53     |
| Percent Detected      | 51.7   | 55.4   | 14.3    | 8.9    | 0.0    | 7.8    | 4.1    | 1.7    | .      | 43.1   | 0.0    | 0.0    | 0.0    | 28.3   |
| Classification Method | A      | A      | P       | -      | -      | -      | -      | -      | -      | P      | -      | -      | -      | P      |

\*=Normal or log normal data distributions were assumed All statistics presented are untransformed (antilog) values. U=Concentration below detection limit M=MANOVA  
.=Value not computed C=Cohen revised statistics UN=Unrevised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table 5-53

|                       | Mg | Mn | Hg | Mo | Ni | K | Se | Ag | Na      | Sr | Tl | Sn | V | Zn |
|-----------------------|----|----|----|----|----|---|----|----|---------|----|----|----|---|----|
| Normal or Log Normal* |    |    |    |    |    |   |    |    | Log     |    |    |    |   |    |
| Upper Tolerance Limit |    | .  | .  | .  | .  | . | .  | .  | 22 4768 | .  |    | .  |   |    |
| Lower Tolerance Limit | .  |    |    | .  | .  |   | .  |    |         |    |    |    |   |    |
| Maximum Concentration |    |    |    |    |    |   |    |    | 35.2    |    |    |    |   |    |
| Minimum Concentration |    |    |    |    |    |   |    |    | 11.6    |    |    |    |   |    |
| Cohen or Unrevised    |    |    |    |    |    |   |    |    | UN      |    |    |    |   |    |
| Mean                  | .  | .  | .  | .  | .  | . | .  | .  | 19 9159 |    | .  | .  | . |    |
| Standard Deviation    | .  | .  |    | .  | .  | . | .  | .  | 1 1598  | .  | .  |    | . |    |
| Sample Size           |    |    |    |    |    |   |    |    | 31      |    |    |    |   |    |
| Percent Detected      |    |    |    |    |    |   |    |    | 100 0   |    |    |    |   |    |
| Classification Method |    |    |    |    |    |   |    |    | A       |    |    |    |   |    |

\*=Normal or log normal data distributions were assumed. All statistics presented are untransformed (antilog) values U=Concentration below detection limit H=MANOVA  
 .=Value not computed C=Cohen revised statistics UN=Unrevised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification p=Test of Proportions

Table 5-54  
Statistics for Dissolved Metal Concentrations in  
Background South Rocky Flats Surface Water Samples  
(Concentration units mg/l)

|                       | Al | Sb | As | Ba | Be | Cd | Ca      | Cs | Cr | Co | Cu | Fe | Pb | Li     |
|-----------------------|----|----|----|----|----|----|---------|----|----|----|----|----|----|--------|
| Normal or Log Normal* |    |    |    |    |    |    | Log     |    |    |    |    |    |    | Normal |
| Upper Tolerance Limit | .  | .  | .  | .  | .  | .  | 39.8803 | .  | .  | .  | .  | .  | .  | .      |
| Lower Tolerance Limit | .  | .  | .  | .  | .  | .  |         | .  | .  | .  | .  | .  | .  | .      |
| Maximum Concentration |    |    |    |    |    |    | 78.4    |    |    |    |    |    |    | 0.10   |
| Minimum Concentration |    |    |    |    |    |    | 12.7    |    |    |    |    |    |    | 0.010  |
| Cohen or Unrevised    |    |    |    |    |    |    | UN      |    |    |    |    |    |    | UN     |
| Mean                  | .  | .  | .  | .  | .  | .  | 33.7082 | .  | .  | .  | .  | .  | .  | 0.0450 |
| Standard Deviation    | .  | .  | .  | .  | .  | .  | 2.7310  | .  | .  | .  | .  | .  | .  | 0.0144 |
| Sample Size           |    |    |    |    |    |    | 27      |    |    |    |    |    |    | 27     |
| Percent Detected      |    |    |    |    |    |    | 100.0   |    |    |    |    |    |    | 0.0    |
| Classification Method |    |    |    |    |    |    | A       |    |    |    |    |    |    | -      |

|                       | Hg | Mn | Hg | Mo | Mi | K | Se | Ag | Na      | Sr | Tl | Sn | V | Zn |
|-----------------------|----|----|----|----|----|---|----|----|---------|----|----|----|---|----|
| Normal or Log Normal* |    |    |    |    |    |   |    |    | Log     |    |    |    |   |    |
| Upper Tolerance Limit | .  | .  | .  | .  | .  | . |    | .  | 16.3758 | .  | .  | .  | . | .  |
| Lower Tolerance Limit | .  | .  | .  | .  | .  | . |    | .  | .       | .  | .  | .  | . | .  |
| Maximum Concentration |    |    |    |    |    |   |    |    | 32.3    |    |    |    |   |    |
| Minimum Concentration |    |    |    |    |    |   |    |    | 6.56    |    |    |    |   |    |
| Cohen or Unrevised    |    |    |    |    |    |   |    |    | UN      |    |    |    |   |    |
| Mean                  | .  | .  | .  | .  | .  | . |    | .  | 13.3162 |    | .  | .  | . | .  |
| Standard Deviation    | .  | .  | .  | .  | .  | . |    | .  | 1.3538  |    | .  | .  | . | .  |
| Sample Size           |    |    |    |    |    |   |    |    | 27      |    |    |    |   |    |
| Percent Detected      |    |    |    |    |    |   |    |    | 100.0   |    |    |    |   |    |
| Classification Method |    |    |    |    |    |   |    |    | A       |    |    |    |   |    |

\*=Normal or log normal data distributions were assumed. All statistics presented are unrevised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA U=Concentration below detection limit M=MANOVA  
.=Value not computed C=Cohen revised statistics UN=Unrevised statistics

Table 5-55  
Statistics for Inorganic Concentrations in  
Background Surface Water Samples  
(Concentration units mg/l except pH)

|                       | HC03     | CO3    | Cl      | CN      | Field pH | NO3/NO2 | SO4     |
|-----------------------|----------|--------|---------|---------|----------|---------|---------|
| Normal or Log Normal* | Log      | Normal | Log     | Normal  | Normal   | Log     | Log     |
| Upper Tolerance Limit | 202.1725 | .      | 15 7253 | .       | 9.0230   | 3 9883  | 36 9676 |
| Lower Tolerance Limit | .        | .      |         | .       | 5 5825   |         |         |
| Maximum Concentration | 1900.0   | 5.0U   | 62 0    | 0 0452  | 9.8      | 11.0    | 560 0   |
| Minimum Concentration | 30.0     | 5 0U   | 3 0U    | 0 0025U | 5 0      | 0.05U   | 5.0U    |
| Cohen or Unrevised    | UN       | UN     | UN      | UN      | UN       | C       | UN      |
| Mean                  | 166.1012 | 2.5000 | 12.6992 | 0 0046  | 7.3028   | 1.5412  | 29.4620 |
| Standard Deviation    | 17.8052  | 0.0000 | 1.4937  | 0 0077  | 0.8580   | 1.2079  | 3.7048  |
| Sample Size           | 59       | 59     | 59      | 56      | 65       | 59      | 59      |
| Percent Detected      | 100 0    | 0.0    | 94 9    | 7.1     | 100 0    | 57.6    | 91 5    |
| Classification Method | A        | -      | A       | -       | A        | A       | A       |

\*=Normal or log normal data distributions were assumed. All statistics presented are untransformed (antilog) values U=Concentration below detection limit M=MANOVA  
.=Value not computed C=Cohen revised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table 5-57  
Statistics for Total Metal Concentrations in  
Background Sediment Samples  
(Concentration units mg/kg)

|                       | Al        | Sb     | As     | Ba      | Be     | Cd     | Ca         | Cs       | Cr      | Co     | Cu     | Fe        | Pb      | Li      |
|-----------------------|-----------|--------|--------|---------|--------|--------|------------|----------|---------|--------|--------|-----------|---------|---------|
| Normal or Log Normal* | Log       | Normal | Normal | Normal  | Normal | Normal | Normal     | Normal   | Log     | Normal | Normal | Normal    | Log     | Normal  |
| Upper Tolerance Limit | 8994.7474 | .      | .      | 182.0   | 3.50   | 3.30   | 52500.0    | 702.00   | 30.4    | 35.10  | 22.0   | 15000.0   | 49.1    | 70.20   |
| Lower Tolerance Limit | .         | .      | .      | 40.40   | 1.00   | 1.00   | 1010.00    | 202.00   | 2.20    | 10.10  | 5.00   | 1040.0    | 2.1     | 20.20   |
| Maximum Concentration | 21600.0   | 42.10  | 13.0   | 182.0   | 3.50   | 3.30   | 52500.0    | 702.00   | 30.4    | 35.10  | 22.0   | 15000.0   | 49.1    | 70.20   |
| Minimum Concentration | 549.0     | 12.10  | 1.90   | 40.40   | 1.00   | 1.00   | 1010.00    | 202.00   | 2.20    | 10.10  | 5.00   | 1040.0    | 2.1     | 20.20   |
| Cohen or Unrevised    | UN        | UN     | UN     | UN      | UN     | UN     | UN         | UN       | C       | UN     | UN     | UN        | UN      | UN      |
| Mean                  | 5427.6204 | 9.7789 | 2.3763 | 62.3382 | 0.8105 | 0.7200 | 5953.4211  | 163.0263 | 11.6300 | 8.1500 | 6.9395 | 6215.2632 | 11.9926 | 16.3026 |
| Standard Deviation    | 1454.2208 | 4.8942 | 2.9133 | 52.5242 | 0.4054 | 0.2999 | 12226.3745 | 81.6577  | 3.8033  | 4.0843 | 6.1120 | 3899.9179 | 2.8160  | 8.1658  |
| Sample Size           | 18        | 19     | 19     | 17      | 19     | 15     | 19         | 19       | 19      | 19     | 19     | 19        | 19      | 19      |
| Percent Detected      | 100.0     | 0.0    | 21.1   | 35.3    | 0.0    | 0.0    | 47.4       | 0.0      | 78.9    | 0.0    | 31.6   | 100.0     | 100.0   | 0.0     |
| Classification Method | A         | -      | P      | P       | -      | -      | P          | -        | A       | -      | P      | A         | A       | -       |

|                       | Mg        | Mn       | Hg     | Mo      | Ni     | K        | Se     | Ag     | Na       | Sr      | Tl     | Sn      | V       | Zn      |
|-----------------------|-----------|----------|--------|---------|--------|----------|--------|--------|----------|---------|--------|---------|---------|---------|
| Normal or Log Normal* | Normal    | Normal   | Normal | Normal  | Normal | Normal   | Normal | Normal | Normal   | Normal  | Normal | Normal  | Log     | Normal  |
| Upper Tolerance Limit | .         | 357.6192 | .      | .       | .      | .        | .      | .      | .        | .       | .      | .       | 24.1350 | 91.7952 |
| Lower Tolerance Limit | .         | .        | .      | .       | .      | .        | .      | .      | .        | .       | .      | .       | .       | .       |
| Maximum Concentration | 4110.0    | 352.0    | 0.350  | 70.20   | 29.9   | 3510.00  | 2.50   | 6.8    | 3510.00  | 397.00  | 4.20   | 70.20   | 50.2    | 79.8    |
| Minimum Concentration | 1010.00   | 9.0      | 0.0930 | 20.20   | 8.10   | 1010.00  | 0.970  | 2.00   | 1010.00  | 23.50   | 1.90   | 20.20   | 10.80   | 6.5     |
| Cohen or Unrevised    | UN        | UN       | UN     | UN      | UN     | UN       | UN     | UN     | UN       | UN      | UN     | UN      | C       | UN      |
| Mean                  | 1163.6842 | 135.8947 | 0.0824 | 16.3026 | 8.6722 | 851.3158 | 0.6671 | 1.7833 | 815.0000 | 82.4500 | 1.2538 | 16.3026 | 15.1788 | 40.6211 |
| Standard Deviation    | 938.9945  | 91.5069  | 0.0413 | 8.1658  | 6.4137 | 423.3459 | 0.2438 | 1.5111 | 408.4286 | 62.3363 | 0.3467 | 8.1658  | 3.6023  | 21.1198 |
| Sample Size           | 19        | 19       | 19     | 19      | 18     | 19       | 19     | 15     | 19       | 19      | 13     | 19      | 17      | 19      |
| Percent Detected      | 26.3      | 100.0    | 0.0    | 0.0     | 22.2   | 5.3      | 0.0    | 6.7    | 0.0      | 15.8    | 0.0    | 0.0     | 52.9    | 100.0   |
| Classification Method | P         | A        | -      | -       | P      | -        | -      | -      | -        | P       | -      | -       | A       | A       |

\*=Normal or log normal data distributions were assumed. All statistics presented are untransformed (antilog) values. U=Concentration below detection limit N=ANOVA  
.=Value not computed C=Cohen revised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table 5-56  
Statistics for Total Radiochemical Concentrations in  
Background Surface Water Samples  
(Concentration units pCi/l)

|                       | Am241  | Cs137  | Alpha    | Beta     | Pu239  | Ra226   | Ra228   | Sr90   | Iritium   | U233,234 | U235   | U238   |
|-----------------------|--------|--------|----------|----------|--------|---------|---------|--------|-----------|----------|--------|--------|
| Normal or Log Normal* | Normal | Normal | Normal   | Normal   | Normal | Normal  | Normal  | Normal | Normal    | Normal   | Normal | Normal |
| Upper Tolerance Limit | 0.1769 | 3.9312 | 177 4289 | 163.2045 | 1.4577 | 29.2468 | 64.2265 | 1.6121 | 2022 4548 | 1 1054   | 0 1863 | 0 9186 |
| Lower Tolerance Limit | .      | .      | .        | .        | .      | .       | .       | .      | .         | .        | .      | .      |
| Maximum Concentration | 0.372  | 12.0   | 440 0    | 420.0    | 4.4    | 30.0    | 24 0    | 1.95   | 980.0     | 1 51     | 0.22   | 1.4    |
| Minimum Concentration | -0.01  | -0.6   | -2.0     | 0.0      | -0.001 | -0.1    | -1 1    | -0 3   | -6930 0   | -0 17    | -0 29  | 0 0    |
| Cohen or Unrevised    | UN     | UN     | UN       | UN       | UN     | UN      | UN      | UN     | UN        | UN       | UN     | UN     |
| Mean                  | 0.0265 | 0.3843 | 25.5367  | 24 2510  | 0.1371 | 5 4308  | 11.4750 | 0.4819 | -96.0000  | 0 3898   | 0 0206 | 0.3128 |
| Standard Deviation    | 0.0717 | 1.7176 | 73.3749  | 67.1246  | 0.6395 | 8.9182  | 10.2552 | 0 5473 | 1025.8894 | 0 3466   | 0.0802 | 0 2934 |
| Sample Size           | 44     | 50     | 49       | 49       | 50     | 13      | 4       | 50     | 50        | 50       | 50     | 50     |
| Percent Detected      | 100.0  | 100.0  | 100.0    | 100.0    | 100 0  | 100.0   | 100 0   | 100 0  | 100 0     | 100 0    | 100.0  | 100.0  |
| Classification Method | KA     | KA     | A        | A        | KA     | A       | A       | A      | A         | A        | KA     | A      |

\*=Normal or log normal data distributions were assumed. All statistics presented are untransformed (antilog) values. U=Concentration below detection limit N=MANOVA  
.=Value not computed C=Cohen revised statistics UN=Unrevised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table 5-58  
Statistics for Inorganic Concentrations in  
Background Sediment Samples  
(Concentration units mg/kg except pH)

|                       | HC03 | CO3 | Cl | CM | Lab pH | NO3/NO2 | SO4 |
|-----------------------|------|-----|----|----|--------|---------|-----|
| Normal or Log Normal* |      |     |    |    | Normal | Normal  |     |
| Upper Tolerance Limit | .    | .   |    |    | 8.9280 | .       | .   |
| Lower Tolerance Limit | .    | .   |    |    | 5.9878 | .       | .   |
| Maximum Concentration |      |     |    |    | 8.7    | 13.0    |     |
| Minimum Concentration |      |     |    |    | 6.1    | 1.1     |     |
| Cohen or Unrevised    |      |     |    |    | UN     | UN      |     |
| Mean                  | .    | .   | .  | .  | 7.4579 | 2.3105  |     |
| Standard Deviation    | .    | .   | .  | .  | 0.6067 | 2.6826  |     |
| Sample Size           |      |     |    |    | 19     | 19      |     |
| Percent Detected      |      |     |    |    | 100.0  | 21.1    |     |
| Classification Method |      |     |    |    | A      | P       |     |

\*=Normal or log normal data distributions were assumed. All statistics presented are untransformed (antilog) values. U=Concentration below detection limit M=MANOVA  
.=Value not computed C=Cohen revised statistics UN=Unrevised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table 5-59  
Statistics for Total Radiochemical Concentrations in  
Background Sediment Samples  
(Concentration units pCi/g)

|                       | Am241   | Cs137  | Alpha   | Beta    | Pu239  | Ra226  | Ra228  | Sr90   | Iritium | U233, 234 | U235   | U238   |
|-----------------------|---------|--------|---------|---------|--------|--------|--------|--------|---------|-----------|--------|--------|
| Normal or Log Normal* | Normal  | Normal | Normal  | Normal  | Normal | Normal | Log    | Normal | Normal  | Normal    | Normal | Log    |
| Upper Tolerance Limit | 0.0281  | 2.5959 | 57.7542 | 51.7571 | 0.0744 | 1.1701 | 1.5765 | 1.1015 | 1.1157  | 1.6135    | 0.9710 | 0.8462 |
| Lower Tolerance Limit |         |        |         |         |        |        |        |        |         |           |        |        |
| Maximum Concentration | 0.02    | 3.2    | 48.0    | 41.9    | 0.08   | 1.1    | 2.3    | 0.99   | 0.97    | 1.48      | 1.34   | 1.3    |
| Minimum Concentration | -0.01   | 0.0    | 4.0     | 10.8    | 0.0    | 0.5    | 0.0    | -0.6   | -0.81   | 0.38      | 0.0    | 0.3    |
| Cohen or Unrevised    | UN      | UN     | UN      | UN      | UN     | UN     | UN     | UN     | UN      | UN        | UN     | UN     |
| Mean                  | -0.0020 | 0.5705 | 21.8800 | 28.6800 | 0.0174 | 0.8000 | 1.3875 | 0.1974 | 0.1726  | 0.7842    | 0.1574 | 0.6769 |
| Standard Deviation    | 0.0103  | 0.8359 | 13.9806 | 8.9934  | 0.0235 | 0.1528 | 0.0780 | 0.3731 | 0.3892  | 0.3423    | 0.3358 | 0.0699 |
| Sample Size           | 10      | 19     | 15      | 15      | 19     | 19     | 19     | 19     | 19      | 19        | 19     | 19     |
| Percent Detected      | 100.0   | 100.0  | 100.0   | 100.0   | 100.0  | 100.0  | 100.0  | 100.0  | 100.0   | 100.0     | 100.0  | 100.0  |
| Classification Method | KA      | KA     | A       | A       | KA     | A      | A      | A      | A       | A         | KA     | A      |

\*=Normal or log normal data distributions were assumed. All statistics presented are unrevised (antilog) values U=Concentration below detection limit H=MANOVA  
.=Value not computed C=Cohen revised statistics UN=Unrevised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table 5-60  
Statistics for Total Metal Concentrations in  
Background Rocky Flats Alluvial Borehole Samples  
(Concentration units mg/kg)

|                       | Al         | Sb      | As     | Ba      | Be     | Cd     | Ca       | Cs  | Cr      | Co         | Cu  | Fe         | Pb  | Li  |
|-----------------------|------------|---------|--------|---------|--------|--------|----------|-----|---------|------------|-----|------------|-----|-----|
| Normal or Log Normal* | Log        | Log     | Log    | Log     | Log    | Log    | Log      | Log | Log     | Log        | Log | Log        | Log | Log |
| Upper Tolerance Limit | 13419.4947 | .       | 4.2988 | 79.4928 | 4.7040 | .      | .        | .   | .       | .          | .   | 13753.5715 | .   | .   |
| Lower Tolerance Limit | .          | .       | .      | .       | .      | .      | .        | .   | .       | .          | .   | .          | .   | .   |
| Maximum Concentration | 40800.0    | 33.20   | 41.7   | 209.0   | 19.0   | 3.2    | 968.00   | .   | 28.1    | 33700.0    | .   | 4670.0     | .   | .   |
| Minimum Concentration | 2240.0     | 4.20    | 1.2    | 80.80   | 0.00   | 0.360  | 404.00   | .   | 3.5     | 12625.8128 | .   | 572.0338   | .   | .   |
| Cohen or Unrevised    | UN         | UN      | C      | C       | UN     | UN     | UN       | UN  | UN      | UN         | UN  | UN         | UN  | UN  |
| Mean                  | 11908.5758 | 13.3144 | 3.6273 | 70.3734 | 3.9766 | 1.2147 | 227.5016 | .   | 12.0462 | 12625.8128 | .   | 572.0338   | .   | .   |
| Standard Deviation    | 766.3845   | 0.4587  | 0.3406 | 4.6256  | 0.3690 | 0.0553 | 3.0252   | .   | 0.3172  | 77         | .   | 77         | .   | .   |
| Sample Size           | 77         | 56      | 77     | 77      | 77     | 54     | 77       | .   | 77      | 77         | .   | 100.0      | .   | .   |
| Percent Detected      | 97.4       | 0.0     | 66.2   | 76.6    | 85.7   | 13.0   | 0.0      | .   | 22.1    | 22.1       | .   | 100.0      | .   | .   |
| Classification Method | A          | -       | KA     | KA      | KA     | P      | -        | .   | P       | A          | .   | A          | .   | .   |

|                       | Hg        | Mn       | Hg  | Mo  | Ni  | K         | Se     | Ag     | Na        | Sr  | Tl  | Sn  | V   | Zn  |
|-----------------------|-----------|----------|-----|-----|-----|-----------|--------|--------|-----------|-----|-----|-----|-----|-----|
| Normal or Log Normal* | Log       | Log      | Log | Log | Log | Log       | Log    | Log    | Log       | Log | Log | Log | Log | Log |
| Upper Tolerance Limit | 2484.2373 | 234.9950 | .   | .   | .   | 1557.9829 | .      | .      | .         | .   | .   | .   | .   | .   |
| Lower Tolerance Limit | .         | .        | .   | .   | .   | .         | .      | .      | .         | .   | .   | .   | .   | .   |
| Maximum Concentration | 5570.0    | 656.0    | .   | .   | .   | 4020.0    | 12.00  | 40.9   | 4840.00   | .   | .   | .   | .   | .   |
| Minimum Concentration | 2020.00   | 2.6      | .   | .   | .   | 981.0     | 0.440  | 0.2    | 206.0     | .   | .   | .   | .   | .   |
| Cohen or Unrevised    | UN        | UN       | .   | .   | .   | C         | UN     | UN     | UN        | .   | .   | .   | .   | .   |
| Mean                  | 2268.1101 | 193.2978 | .   | .   | .   | 1371.6389 | 2.6324 | 5.0794 | 1132.9907 | .   | .   | .   | .   | .   |
| Standard Deviation    | 109.6264  | 21.1501  | .   | .   | .   | 94.4020   | 0.3535 | 0.6858 | 29.5303   | .   | .   | .   | .   | .   |
| Sample Size           | 77        | 77       | .   | .   | .   | 76        | 53     | 71     | 77        | .   | .   | .   | .   | .   |
| Percent Detected      | 92.2      | 100.0    | .   | .   | .   | 52.6      | 0.0    | 32.4   | 1.3       | .   | .   | .   | .   | .   |
| Classification Method | KA        | KA       | .   | .   | .   | KA        | -      | P      | -         | .   | .   | .   | .   | .   |

\*=Normal or log normal data distributions were assumed. All statistics presented are untransformed (anti-log) values. U=Concentration below detection limit N=MANOVA  
.=Value not computed C=Cohen revised statistics UN=Unrevised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA P=Test of Proportions

Table 5-61  
Statistics for Total Metal Concentrations in  
Background North Rocky Flats Borehole Samples  
(Concentration units mg/kg)

|                       | Al | Sb | As     | Ba      | Be      | Cd      | Ca        | Cs | Cr      | Co      | Cu      | Fe      | Pb      | L1      |
|-----------------------|----|----|--------|---------|---------|---------|-----------|----|---------|---------|---------|---------|---------|---------|
| Normal or Log Normal* |    |    |        |         |         |         | Log       |    | Log     |         | Log     |         | Log     | Log     |
| Upper Tolerance Limit | .  | .  | .      | .       | .       | .       | 8430 1986 | .  | 19.9897 | .       | 11.1314 | .       | 12.1546 |         |
| Lower Tolerance Limit | .  | .  | .      | .       | .       | .       |           | .  | .       | .       | .       | .       | .       |         |
| Maximum Concentration |    |    |        |         |         |         | 157000 0  |    | 69 6    |         | 16 6    |         | 25.7    | 31.3    |
| Minimum Concentration |    |    |        |         |         |         | 1150 0    |    | 4.0     |         | 10.4U   |         | 2.1     | 16 1    |
| Cohen or Unrevised    |    |    |        |         |         |         | UN        |    | UN      |         | UN      |         | UN      | UN      |
| Mean                  | .  | .  | .      | .       | .       | .       | 6005.5435 | .  | 15 8774 | .       | 10 0000 | .       | 9.4064  | 22.7441 |
| Standard Deviation    | .  | .  | .      | .       | .       | .       | 1123.7350 | .  | 1.9059  | .       | 0 5244  | .       | 1.2737  | 0.3750  |
| Sample Size           |    |    |        |         |         |         | 36        |    | 36      |         | 36      |         | 36      | 36      |
| Percent Detected      |    |    |        |         |         |         | 97 2      |    | 100.0   |         | 91 7    |         | 100.0   | 5.6     |
| Classification Method |    |    |        |         |         |         | KA        |    | A       |         | KA      |         | KA      | -       |
|                       | Hg | Mn | Hg     | Mo      | Ni      | K       | Se        | Ag | Na      | Sr      | Tl      | Sn      | V       | Zn      |
| Normal or Log Normal* |    |    | Log    | Log     | Log     |         |           |    |         | Log     | Log     | Log     | Log     | Log     |
| Upper Tolerance Limit | .  | .  | .      | .       | .       | 21.4229 | .         | .  | .       | .       | .       | .       | 37 1857 | 39 7143 |
| Lower Tolerance Limit | .  | .  | .      | .       | .       | .       | .         | .  | .       | .       | .       | .       | .       | .       |
| Maximum Concentration |    |    | 0.32   | 41 0    | 54.2    |         |           |    |         | 226.0   | 5.4U    | 312 0   | 70 0    | 77.6    |
| Minimum Concentration |    |    | 0 22U  | 18.5    | 17.4U   |         |           |    |         | 41.6U   | 3 6U    | 41.6U   | 20 6U   | 0 3     |
| Cohen or Unrevised    |    |    | UN     | UN      | C       |         |           |    |         | UN      | UN      | UN      | UN      | UN      |
| Mean                  | .  | .  | 0.1394 | 23 7203 | 17 3420 | .       | .         | .  | .       | 29.5841 | 2 2752  | 32.2089 | 30.4651 | 28.6620 |
| Standard Deviation    | .  | .  | 0.0073 | 0.5731  | 1 8666  | .       | .         | .  | .       | 2 2803  | 0.0507  | 2 9266  | 3.1147  | 5 1224  |
| Sample Size           |    |    | 35     | 36      | 33      |         |           |    |         | 36      | 20      | 33      | 36      | 36      |
| Percent Detected      |    |    | 22.9   | 25.0    | 78.8    |         |           |    |         | 30.6    | 0.0     | 36.4    | 91.7    | 100.0   |
| Classification Method |    |    | P      | P       | KA      |         |           |    |         | P       | -       | P       | KA      | KA      |

\*Normal or log normal data distributions were assumed. All statistics presented are untransformed (antilog) values. U=Concentration below detection limit H=MANOVA  
 .-Value not computed C=Cohen revised statistics UN=Unrevised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table 5-62  
Statistics for Total Metal Concentrations in  
Background South Rocky Flats Rocky Flats Alluvial Borehole Samples  
(Concentration units mg/kg)

|                       | Al  | Sb  | As     | Ba     | Be      | Cd  | Ca        | Cs  | Cr      | Co       | Cu      | Fe      | Pb      | L1      |
|-----------------------|-----|-----|--------|--------|---------|-----|-----------|-----|---------|----------|---------|---------|---------|---------|
| Normal or Log Normal* | Log | Log | Log    | Log    | Log     | Log | Log       | Log | Log     | Log      | Log     | Log     | Log     | Log     |
| Upper Tolerance Limit | .   | .   | .      | .      | .       | .   | 3491.2752 | .   | 20.0597 | .        | 11.3487 | .       | 7.8895  | 8 0784  |
| Lower Tolerance Limit | .   | .   | .      | .      | .       | .   |           | .   |         | .        |         | .       | .       |         |
| Maximum Concentration |     |     |        |        |         |     | 9520.0    |     | 31.7    |          | 31.6    |         | 14 6    | 44 8U   |
| Minimum Concentration |     |     |        |        |         |     | 1130.0    |     | 5.6     |          | 10 2U   |         | 2.6     | 4 0U    |
| Cohen or Unrevised    |     |     |        |        |         |     | UN        |     | UN      |          | C       |         | UN      | UN      |
| Mean                  | .   | .   | .      | .      | .       | .   | 2949.1578 | .   | 17.7587 | .        | 9 5531  | .       | 6 8275  | 7 0388  |
| Standard Deviation    | .   | .   | .      | .      | .       | .   | 255.9200  | .   | 1 0863  | .        | 0.8477  | .       | 0.5013  | 0 4908  |
| Sample Size           |     |     |        |        |         |     | 41        |     | 41      |          | 41      |         | 41      | 41      |
| Percent Detected      |     |     |        |        |         |     | 97.6      |     | 100 0   |          | 78.0    |         | 97.6    | 95 1    |
| Classification Method |     |     |        |        |         |     | KA        |     | A       |          | KA      |         | KA      | KA      |
|                       | Hg  | Mn  | Hg     | Mo     | Ni      | K   | Se        | Ag  | Na      | Sr       | Tl      | Sn      | V       | Zn      |
| Normal or Log Normal* | Log | Log | Log    | Log    | Log     | Log | Log       | Log | Log     | Log      | Log     | Log     | Log     | Log     |
| Upper Tolerance Limit | .   | .   | 0 2040 | 7.6941 | 26.1999 | .   | .         | .   | .       | .        | .       | .       | 29 8145 | 27 6637 |
| Lower Tolerance Limit | .   | .   |        |        |         | .   | .         | .   | .       | .        | .       | .       | .       | .       |
| Maximum Concentration |     |     | 0.58   | 44 8U  | 40 3    |     |           |     |         | 968 0U   | 9.8U    | 338.0   | 50.7    | 64 6    |
| Minimum Concentration |     |     | 0 166U | 4 0U   | 5.1     |     |           |     |         | 40.6U    | 0.66U   | 40 4U   | 23 2U   | 8 0U    |
| Cohen or Unrevised    |     |     | C      | C      | UN      |     |           |     |         | UN       | UN      | UN      | UN      | UN      |
| Mean                  | .   | .   | 0.1512 | 6.5084 | 22.1298 | .   | .         | .   | .       | 166.9678 | 2.2567  | 66 7923 | 26 9557 | 21.2697 |
| Standard Deviation    | .   | .   | 0 0235 | 0.5597 | 1.9214  | .   | .         | .   | .       | 38.9685  | 0.1202  | 13 4219 | 1.3495  | 2.9977  |
| Sample Size           |     |     | 28     | 41     | 41      |     |           |     |         | 41       | 41      | 41      | 41      | 39      |
| Percent Detected      |     |     | 53 6   | 82 9   | 92 7    |     |           |     |         | 2.4      | 0.0     | 22 0    | 97.6    | 87.2    |
| Classification Method |     |     | KA     | KA     | KA      |     |           |     |         | -        | -       | P       | KA      | KA      |

\*=Normal or log normal data distributions were assumed. All statistics presented are untransformed (antilog) values U=Concentration below detection limit M=MANOVA  
.=Value not computed C=Cohen revised statistics UN=Unrevised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table 5-63

Statistics for Inorganic Concentrations in  
Background Rocky Flats Alluvial Borehole Samples  
(Concentration units mg/kg except pH)

|                       | HCO <sub>3</sub> | CO <sub>3</sub> | Cl | CN | Lab pH | NO <sub>3</sub> /NO <sub>2</sub> | SO <sub>4</sub> |
|-----------------------|------------------|-----------------|----|----|--------|----------------------------------|-----------------|
| Normal or Log Normal* |                  |                 |    |    | Normal |                                  |                 |
| Upper Tolerance Limit | .                |                 |    |    | 9.5174 |                                  |                 |
| Lower Tolerance Limit | .                |                 |    |    | 6.3858 | .                                |                 |
| Maximum Concentration |                  |                 |    |    | 9.1    |                                  |                 |
| Minimum Concentration |                  |                 |    |    | 6.1    |                                  |                 |
| Cohen or Unrevised    |                  |                 |    |    | UN     |                                  |                 |
| Mean                  | .                |                 |    | .  | 7.9516 | .                                | .               |
| Standard Deviation    | .                |                 |    | .  | 0.7771 | .                                | .               |
| Sample Size           |                  |                 |    |    | 62     |                                  |                 |
| Percent Detected      |                  |                 |    |    | 100.0  |                                  |                 |
| Classification Method |                  |                 |    |    | KA     |                                  |                 |

\*=Normal or log normal data distributions were assumed. All statistics presented are untransformed (antilog) values. U=Concentration below detection limit N=MANOVA  
 .=Value not computed C=Cohen revised statistics UN=UNrevised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table 5-64  
Statistics for Inorganic Concentrations in  
Background North Rocky Flats Rocky Flats Alluvial Borehole Samples  
(Concentration units mg/kg except pH)

|                       | HC03 | CO3 | Cl | CN | Lab pH | NO3/NO2 | SO4 |
|-----------------------|------|-----|----|----|--------|---------|-----|
| Normal or Log Normal* |      |     |    |    |        | Normal  |     |
| Upper Tolerance Limit | .    | .   | .  | .  | .      | .       | .   |
| Lower Tolerance Limit | .    | .   | .  | .  | .      | .       | .   |
| Maximum Concentration |      |     |    |    |        | 4.3     |     |
| Minimum Concentration |      |     |    |    |        | 1.10    |     |
| Cohen or Unrevised    |      |     |    |    |        | UN      |     |
| Mean                  |      |     | .  | .  | .      | 0.8583  | .   |
| Standard Deviation    | .    | .   | .  | .  | .      | 0.8701  | .   |
| Sample Size           |      |     |    |    |        | 30      |     |
| Percent Detected      |      |     |    |    |        | 13.3    |     |
| Classification Method |      |     |    |    |        | P       |     |

\*=Normal or log normal data distributions were assumed. All statistics presented are untransformed (antilog) values. U=Concentration below detection limit M=MANOVA  
.=Value not computed C=Cohen revised statistics UN=Unrevised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table 5-65  
Statistics for Inorganic Concentrations in  
Background South Rocky Flats Rocky Flats Alluvial Borehole Samples  
(Concentration units mg/kg except pH)

|                       | HCO3 | CO3 | Cl | CN | Lab pH | NO3/NO2 | SO4 |
|-----------------------|------|-----|----|----|--------|---------|-----|
| Normal or Log Normal* |      |     |    |    |        | Normal  |     |
| Upper Tolerance Limit | .    | .   | .  | .  | .      | .       | .   |
| Lower Tolerance Limit | .    | .   | .  | .  | .      | .       | .   |
| Maximum Concentration |      |     |    |    |        | 3.3     |     |
| Minimum Concentration |      |     |    |    |        | 1.00    |     |
| Cohen or Unrevised    |      |     |    |    |        | UN      |     |
| Mean                  | .    | .   | .  | .  | .      | 0.9828  |     |
| Standard Deviation    | .    | .   | .  | .  | .      | 0.7055  |     |
| Sample Size           |      |     |    |    |        | 32      |     |
| Percent Detected      |      |     |    |    |        | 34.4    |     |
| Classification Method |      |     |    |    |        | P       |     |

\*=Normal or log normal data distributions were assumed. All statistics presented are untransformed (antilog) values U=Concentration below detection limit H=MANOVA  
.=Value not computed C=Cohen revised statistics UN=Unrevised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table 5-66  
Statistics for Total Radiochemical Concentrations in  
Background Rocky Flats Alluvial Borehole Samples  
(Concentration Units pCi/g except Tritium Units pCi/ml)

|                       | Am241   | Cs137  | Alpha   | Beta    | Pu239  | Ra226  | Ra228  | Sr90   | Tritium | U233,234 | U235   | U238   |
|-----------------------|---------|--------|---------|---------|--------|--------|--------|--------|---------|----------|--------|--------|
| Normal or Log Normal* | Normal  | Normal | Normal  | Normal  | Normal | Log    | Normal | Normal | Normal  | Log      | Normal | Log    |
| Upper Tolerance Limit | 0.0135  | 0.0669 | 38 3636 | 36.8150 | 0.0150 | 0.6513 | 1.9561 | 0.7256 | 0.4147  | 0.6558   | 0.0741 | 0.6830 |
| Lower Tolerance Limit | .       | .      | .       | .       | .      | .      | .      | .      | .       | .        | .      | .      |
| Maximum Concentration | 0.01    | 0.2    | 42.0    | 44.0    | 0.02   | 0.9    | 2.2    | 1.2    | 0.44    | 3.4      | 0.1    | 3.2    |
| Minimum Concentration | -0.01   | 0.0    | 3.0     | 6.0     | -0.01  | 0.4    | 0.5    | -0.6   | -0.15   | 0.2      | 0.0    | 0.2    |
| Cohen or Unrevised    | UN      | UN     | UN      | UN      | UN     | UN     | UN     | UN     | UN      | UN       | UN     | UN     |
| Mean                  | -0.0015 | 0.0063 | 21.5016 | 23.4844 | 0.0020 | 0.6237 | 1.3220 | 0.0344 | 0.1773  | 0.5923   | 0.0109 | 0.6154 |
| Standard Deviation    | 0.0066  | 0.0302 | 8.3964  | 6.6380  | 0.0065 | 0.0136 | 0.3130 | 0.3442 | 0.1182  | 0.0316   | 0.0315 | 0.0336 |
| Sample Size           | 27      | 64     | 64      | 64      | 64     | 59     | 59     | 64     | 64      | 64       | 64     | 64     |
| Percent Detected      | 100.0   | 100.0  | 100.0   | 100.0   | 100.0  | 100.0  | 100.0  | 100.0  | 100.0   | 100.0    | 100.0  | 100.0  |
| Classification Method | KA      | KA     | A       | A       | KA     | KA     | A      | A      | A       | A        | KA     | A      |

\*=Normal or log normal data distributions were assumed. All statistics presented are untransformed (antilog) values. U=Concentration below detection limit N=MANOVA  
.=Value not computed C=Cohen revised statistics UN=Unrevised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table 5-67

Statistics for Total Metal Concentrations in  
Background Colluvial, Weathered Claystone and Weathered Sandstone Borehole Samples  
(Concentration units mg/kg)

|                       | Al         | Sb      | As     | Ba       | Be     | Cd     | Ca       | Cs  | Cr      | Co    | Cu         | Fe         | Pb  | Li  |
|-----------------------|------------|---------|--------|----------|--------|--------|----------|-----|---------|-------|------------|------------|-----|-----|
| Normal or Log Normal* | Log        | Log     | Log    | Log      | Log    | Log    | Log      | Log | Log     | Log   | Log        | Log        | Log | Log |
| Upper Tolerance Limit | 10427 7752 | .       | 4.0203 | 121 8903 | 3.4013 | .      | .        | .   | .       | .     | .          | 14726.3649 | .   | .   |
| Lower Tolerance Limit | .          | .       | .      | .        | .      | .      | .        | .   | .       | .     | .          | .          | .   | .   |
| Maximum Concentration | 22900 0    | 16.2    | 10 8   | 491 0    | 10 3   | 2 6U   | 516 0U   | .   | 29 7    | 29 7  | 38100.0    | .          | .   | .   |
| Minimum Concentration | 800.0      | 25.4U   | 0.0U   | 45.2     | 2.2U   | 2.2U   | 424.0U   | .   | 21 2U   | 21 2U | 2940.0     | .          | .   | .   |
| Cohen or Unrevised    | UN         | UN      | C      | UN       | UN     | UN     | UN       | UN  | UN      | UN    | UN         | UN         | UN  | UN  |
| Mean                  | 8762.0760  | 14.1232 | 3.2776 | 104.4600 | 2.9791 | 1 1634 | 231.9456 | .   | 12.4683 | .     | 12589.9332 | .          | .   | .   |
| Standard Deviation    | 798 3317   | 0.1456  | 0.3559 | 8.3539   | 0.2023 | 0.0084 | 1.8856   | .   | 0.3242  | .     | 1021.0666  | .          | .   | .   |
| Sample Size           | 46         | 30      | 46     | 46       | 46     | 41     | 36       | .   | 46      | .     | 45         | .          | .   | .   |
| Percent Detected      | 100.0      | 6.7     | 60.9   | 91.3     | 95.7   | 0.0    | 0.0      | .   | 13 0    | .     | 100.0      | .          | .   | .   |
| Classification Method | A          | -       | KA     | KA       | KA     | -      | -        | -   | P       | P     | A          | .          | .   | .   |

|                       | Hg        | Mn       | Hg  | Mo  | Mi  | K   | Se  | Ag  | Na  | Sr  | Tl  | Sn  | V   | Zn  |
|-----------------------|-----------|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Normal or Log Normal* | Log       | Log      | Log | Log | Log | Log | Log | Log | Log | Log | Log | Log | Log | Log |
| Upper Tolerance Limit | 2799 1426 | 203 0125 | .   | .   | .   | .   | .   | .   | .   | .   | .   | .   | .   | .   |
| Lower Tolerance Limit | .         | .        | .   | .   | .   | .   | .   | .   | .   | .   | .   | .   | .   | .   |
| Maximum Concentration | 5580 0    | 737.0    | .   | .   | .   | .   | .   | .   | .   | .   | .   | .   | .   | .   |
| Minimum Concentration | 2120.0U   | 11.6     | .   | .   | .   | .   | .   | .   | .   | .   | .   | .   | .   | .   |
| Cohen or Unrevised    | UN        | UN       | .   | .   | .   | .   | .   | .   | .   | .   | .   | .   | .   | .   |
| Mean                  | 2492.8544 | 155.7160 | .   | .   | .   | .   | .   | .   | .   | .   | .   | .   | .   | .   |
| Standard Deviation    | 146 7970  | 22.6681  | .   | .   | .   | .   | .   | .   | .   | .   | .   | .   | .   | .   |
| Sample Size           | 46        | 46       | .   | .   | .   | .   | .   | .   | .   | .   | .   | .   | .   | .   |
| Percent Detected      | 95 7      | 100.0    | .   | .   | .   | .   | .   | .   | .   | .   | .   | .   | .   | .   |
| Classification Method | KA        | KA       | .   | .   | .   | .   | .   | .   | .   | .   | .   | .   | .   | .   |

\*=Normal or log normal data distributions were assumed. All statistics presented are untransformed (antilog) values. U=Concentration below detection limit M=MANOVA  
 .=Value not computed C=Cohen revised statistics UN=Unrevised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table 5-68

Statistics for Total Metal Concentrations in  
Background North Rocky Flats Colluvial, Weathered Claystone and Weathered Sandstone Borehole Samples  
(Concentration units mg/kg)

|                       | Al | Sb | As     | Ba      | Be      | Cd | Ca        | Cs | Cr      | Co      | Cu      | Fe       | Pb      | Li      |
|-----------------------|----|----|--------|---------|---------|----|-----------|----|---------|---------|---------|----------|---------|---------|
| Normal or Log Normal* |    |    |        |         |         |    | Log       |    | Log     |         | Log     |          | Log     | Log     |
| Upper Tolerance Limit | .  | .  | .      | .       | .       | .  | 7566.5613 | .  | 10.3477 | .       | 16.2533 | .        | 18.6811 | 11 6003 |
| Lower Tolerance Limit | .  | .  | .      | .       | .       | .  | .         | .  | .       | .       | .       | .        | .       | .       |
| Maximum Concentration |    |    |        |         |         |    | 44300 0   |    | 21.3    |         | 26.7    |          | 28.2    | 48 4U   |
| Minimum Concentration |    |    |        |         |         |    | 2310 0    |    | 3.0     |         | 12.0U   |          | 9.4     | 4 2U    |
| Cohen or Unrevised    |    |    |        |         |         |    | UN        |    | UN      |         | UN      |          | UN      | C       |
| Mean                  | .  | .  | .      | .       | .       | .  | 6330.0302 | .  | 8.8363  | .       | 14.2801 | .        | 16.7633 | 9.3502  |
| Standard Deviation    | .  | .  | .      | .       | .       | .  | 560.0235  | .  | 0.6845  | .       | 0.8889  | .        | 0.8686  | 1 0191  |
| Sample Size           |    |    |        |         |         |    | 31        |    | 31      |         | 30      |          | 31      | 31      |
| Percent Detected      |    |    |        |         |         |    | 100.0     |    | 100.0   |         | 96.7    |          | 100.0   | 80 6    |
| Classification Method |    |    |        |         |         |    | KA        |    | A       |         | KA      |          | KA      | KA      |
|                       | Mg | Mn | Hg     | Mo      | Ni      | K  | Se        | Ag | Na      | Sr      | Tl      | Sn       | V       | Zn      |
| Normal or Log Normal* |    |    | Log    | Log     | Log     |    |           |    |         | Log     | Log     | Log      | Log     | Log     |
| Upper Tolerance Limit | .  | .  | .      | 13.4310 | 20.1842 | .  | .         | .  | .       | 64 0675 | .       | .        | 23.7320 | 62.3409 |
| Lower Tolerance Limit | .  | .  | .      | .       | .       | .  | .         | .  | .       | .       | .       | .        | .       | .       |
| Maximum Concentration |    |    | 0.44   | 48 4U   | 62.4    |    |           |    |         | 113.0   | 5.0U    | 441 0    | 40.9    | 129 0   |
| Minimum Concentration |    |    | 0.2U   | 4.2U    | 17.0U   |    |           |    |         | 47 8U   | 4.2U    | 42 4U    | 21.2U   | 24 1    |
| Cohen or Unrevised    |    |    | UN     | UN      | UN      |    |           |    |         | UN      | UN      | UN       | UN      | UN      |
| Mean                  | .  | .  | 0.1667 | 10.3654 | 16.6965 | .  | .         | .  | .       | 55 7825 | 2.3167  | 120 9295 | 20.5495 | 54.0536 |
| Standard Deviation    | .  | .  | 0.0141 | 1.3884  | 1.5530  | .  | .         | .  | .       | 3.7523  | 0.0222  | 39.0482  | 1.3887  | 3.7533  |
| Sample Size           |    |    | 30     | 31      | 28      |    |           |    |         | 31      | 30      | 22       | 25      | 31      |
| Percent Detected      |    |    | 30.0   | 74.2    | 89 3    |    |           |    |         | 96 8    | 3.3     | 36 4     | 88.0    | 100 0   |
| Classification Method |    |    | P      | KA      | KA      |    |           |    |         | KA      | -       | P        | KA      | KA      |

\*=Normal or log normal data distributions were assumed. All statistics presented are untransformed (antilog) values. U=Concentration below detection limit N=MANOVA  
.-Value not computed C=Cohen revised statistics UN=Unrevised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table 5-69

Statistics for Total Metal Concentrations in  
Background South Rocky Flats Colluvial, Weathered Claystone and Weathered Sandstone Borehole Samples  
(Concentration units mg/kg)

|                       | Al | Sb | As     | Ba      | Be      | Cd | Ca         | Cs | Cr      | Co      | Cu      | Fe      | Pb      | L1      |
|-----------------------|----|----|--------|---------|---------|----|------------|----|---------|---------|---------|---------|---------|---------|
| Normal or Log Normal* |    |    |        |         |         |    | Log        |    | Log     |         | Log     |         | Log     | Log     |
| Upper Tolerance Limit | .  | .  | .      | .       | .       | .  | 12314.5488 | .  | 18.7974 | .       | 17.0035 | .       | 21.3174 | 12 1433 |
| Lower Tolerance Limit | .  | .  | .      | .       | .       | .  |            | .  | .       | .       | .       | .       | .       |         |
| Maximum Concentration |    |    |        |         |         |    | 25900.0    |    | 26.9    |         | 23.0    |         | 25.0    | 18.0    |
| Minimum Concentration |    |    |        |         |         |    | 3120.0     |    | 7.5     |         | 12.20   |         | 6.6     | 3.3     |
| Cohen or Unrevised    |    |    |        |         |         |    | UN         |    | UN      |         | UN      |         | UN      | UN      |
| Mean                  | .  | .  | .      | .       | .       | .  | 8399.2202  | .  | 14.8033 | .       | 13.3473 | .       | 17.1722 | 8 8951  |
| Standard Deviation    | .  | .  | .      | .       | .       | .  | 1525.8488  | .  | 1.5565  | .       | 1.4249  | .       | 1.6154  | 1 2659  |
| Sample Size           |    |    |        |         |         |    | 15         |    | 15      |         | 15      |         | 15      | 15      |
| Percent Detected      |    |    |        |         |         |    | 100.0      |    | 100.0   |         | 93.3    |         | 100.0   | 100.0   |
| Classification Method |    |    |        |         |         |    | KA         |    | A       |         | KA      |         | KA      | KA      |
|                       | Mg | Mn | Hg     | Mo      | Ni      | K  | Se         | Ag | Na      | Sr      | Tl      | Sn      | V       | Zn      |
| Normal or Log Normal* |    |    | Log    | Log     | Log     |    |            |    |         | Log     | Log     | Log     | Log     | Log     |
| Upper Tolerance Limit | .  | .  | 0.1496 | 20.8220 | 23.2001 | .  | .          | .  | .       | 93.4362 |         | .       | 43.5171 | 76.6957 |
| Lower Tolerance Limit | .  | .  | .      | .       | .       | .  | .          | .  | .       |         |         | .       | .       |         |
| Maximum Concentration |    |    | 0.2    | 26.8    | 32.3    |    |            |    |         | 121.0   | 5.00    | 51.60   | 58.8    | 133.0   |
| Minimum Concentration |    |    | 0.1940 | 2.8     | 18.00   |    |            |    |         | 28.5    | 4.40    | 45.00   | 15.1    | 23.9    |
| Cohen or Unrevised    |    |    | C      | UN      | C       |    |            |    |         | UN      | UN      | UN      | UN      | UN      |
| Mean                  | .  | .  | 0.1212 | 14.1638 | 17.0844 | .  | .          | .  | .       | 71.5932 | 2.3375  | 23.8599 | 34.3487 | 59.7989 |
| Standard Deviation    | .  | .  | 0.0111 | 2.5948  | 2.3833  | .  | .          | .  | .       | 8.5125  | 0.0322  | 0.2369  | 3.5730  | 6.5849  |
| Sample Size           |    |    | 15     | 15      | 15      |    |            |    |         | 15      | 8       | 15      | 15      | 15      |
| Percent Detected      |    |    | 53.3   | 93.3    | 73.3    |    |            |    |         | 100.0   | 0.0     | 0.0     | 100.0   | 100.0   |
| Classification Method |    |    | KA     | KA      | KA      |    |            |    |         | KA      |         |         | KA      | KA      |

\*=Normal or log normal data distributions were assumed. All statistics presented are untransformed (antilog) values U=Concentration below detection limit H=MANOVA  
 . =Value not computed C=Cohen revised statistics UN=Unrevised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table 5-70  
Statistics for Inorganic Concentrations in  
Background Colluvial, Weathered Claystone and Weathered Sandstone Borehole Samples  
(Concentration units mg/kg except pH)

|                       | HC03 | CO3 | Cl | CN | Lab pH | NO3/MO2 | SO4 |
|-----------------------|------|-----|----|----|--------|---------|-----|
| Normal or Log Normal* |      |     |    |    | Normal |         |     |
| Upper Tolerance Limit | .    | .   | .  | .  | 9.5161 | .       | .   |
| Lower Tolerance Limit | .    | .   | .  | .  | 7.2914 | .       | .   |
| Maximum Concentration |      |     |    |    | 9.7    |         |     |
| Minimum Concentration |      |     |    |    | 7.2    |         |     |
| Cohen or Unrevised    |      |     |    |    | UN     |         |     |
| Mean                  | .    | .   | .  | .  | 8.4038 | .       | .   |
| Standard Deviation    | .    | .   | .  | .  | 0.5424 | .       | .   |
| Sample Size           |      |     |    |    | 53     |         |     |
| Percent Detected      |      |     |    |    | 100.0  |         |     |
| Classification Method |      |     |    |    | KA     |         |     |

\*=Normal or log normal data distributions were assumed. All statistics presented are untransformed (antilog) values. U=Concentration below detection limit N=MANOVA  
.=Value not computed C=Cohen revised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table 5-71  
Statistics for Inorganic Concentrations in  
Background North Rocky Flats Colluvial, Weathered Claystone and Weathered Sandstone Borehole Samples  
(Concentration units mg/kg except pH)

|                       | HC03 | CO3 | Cl | CN | Lab pH | NO3/MO2 | SO4 |
|-----------------------|------|-----|----|----|--------|---------|-----|
| Normal or Log Normal* |      |     |    |    |        | Normal  |     |
| Upper Tolerance Limit | .    | .   | .  | .  | .      | .       | .   |
| Lower Tolerance Limit | .    | .   | .  | .  | .      | .       | .   |
| Maximum Concentration |      |     |    |    |        | 2.5     |     |
| Minimum Concentration |      |     |    |    |        | 1.1U    |     |
| Cohen or Unrevised    |      |     |    |    |        | UM      |     |
| Mean                  | .    | .   | .  | .  | .      | 0.8953  | .   |
| Standard Deviation    | .    | .   | .  | .  | .      | 0.5303  | .   |
| Sample Size           |      |     |    |    |        | 32      |     |
| Percent Detected      |      |     |    |    |        | 31.3    |     |
| Classification Method |      |     |    |    |        | P       |     |

\*=Normal or log normal data distributions were assumed. All statistics presented are untransformed (antilog) values. U=Concentration below detection limit M=MANOVA  
.=Value not computed C=Cohen revised statistics UM=UMrevised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table 5-72

Statistics for Inorganic Concentrations in  
Background South Rocky Flats Colluvial, Weathered Claystone and Weathered Sandstone Borehole Samples  
(Concentration units mg/kg except pH)

|                       | HC03 | CO3 | Cl | CN | Lab pH | NO3/NO2 | SO4 |
|-----------------------|------|-----|----|----|--------|---------|-----|
| Normal or Log Normal* |      |     |    |    |        | Normal  |     |
| Upper Tolerance Limit | .    | .   | .  | .  | .      | 4.6824  | .   |
| Lower Tolerance Limit | .    | .   | .  | .  | .      | .       | .   |
| Maximum Concentration |      |     |    |    |        | 3.7     |     |
| Minimum Concentration |      |     |    |    |        | 1.1U    |     |
| Cohen or Unrevised    |      |     |    |    |        | C       |     |
| Mean                  | .    | .   | .  | .  | .      | 1.4430  | .   |
| Standard Deviation    | .    | .   | .  | .  | .      | 1.3660  | .   |
| Sample Size           |      |     |    |    |        | 21      |     |
| Percent Detected      |      |     |    |    |        | 71.4    |     |
| Classification Method |      |     |    |    |        | P       |     |

\*=Normal or log normal data distributions were assumed. All statistics presented are untransformed (antilog) values. U=Concentration below detection limit N=ANOVA  
 .=Value not computed C=Cohen revised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

Table 5-73  
Statistics for Total Radiochemical Concentrations in  
Background Colluvial, Weathered Claystone and Weathered Sandstone Borehole Samples  
(Concentration units pCi/g except Tritium units pCi/ml)

|                       | Am241 | Cs137  | Alpha   | Beta    | Pu239  | Ra226  | Ra228  | Si-90   | Tritium | U233,234 | U235   | U238   |
|-----------------------|-------|--------|---------|---------|--------|--------|--------|---------|---------|----------|--------|--------|
| Normal or Log Normal* |       | Normal | Normal  | Normal  | Normal | Log    | Normal | Normal  | Normal  | Log      | Normal | Log    |
| Upper Tolerance Limit | .     | 0.0745 | 48.4255 | 34.1512 | 0.0209 | 1.1379 | 2.0537 | 0.6719  | 0.2875  | 0.9830   | 0.1756 | 1.0429 |
| Lower Tolerance Limit | .     | .      | .       | .       | .      | .      | .      | .       | .       | .        | .      | .      |
| Maximum Concentration |       | 0.2    | 48.0    | 34.0    | 0.02   | 1.3    | 2.1    | 0.8     | 0.39    | 2.6      | 0.3    | 2.3    |
| Minimum Concentration |       | 0.0    | 17.0    | 18.0    | -0.01  | 0.7    | 1.0    | -0.8    | -0.14   | 0.4      | 0.0    | 0.4    |
| Cohen or Unrevised    |       | UN     | UN      | UN      | UN     | UN     | UN     | UN      | UN      | UN       | UN     | UN     |
| Mean                  | .     | 0.0074 | 30.6852 | 26.2593 | 0.0046 | 1.0769 | 1.4447 | -0.0759 | 0.0550  | 0.8788   | 0.0407 | 0.9575 |
| Standard Deviation    | .     | 0.0328 | 8.6697  | 3.8568  | 0.0079 | 0.0285 | 0.2845 | 0.3655  | 0.1136  | 0.0509   | 0.0659 | 0.0417 |
| Sample Size           |       | 54     | 54      | 54      | 54     | 38     | 38     | 54      | 54      | 54       | 54     | 54     |
| Percent Detected      |       | 100.0  | 100.0   | 100.0   | 100.0  | 100.0  | 100.0  | 100.0   | 100.0   | 100.0    | 100.0  | 100.0  |
| Classification Method |       | KA     | A       | A       | KA     | KA     | A      | A       | A       | A        | KA     | A      |

\*=Normal or log normal data distributions were assumed. All statistics presented are untransformed (antilog) values. U=Concentration below detection limit H=HANOVA  
 .-Value not computed C=Cohen revised statistics UN=Unrevised statistics A=Parametric ANOVA K=Kruskal-Wallis nonparametric ANOVA \_=No classification P=Test of Proportions

**APPENDIX A**

**FIELD AND**

**ANALYTICAL DATA**

Total Samples, by analyte group, for 1989 Background Sediment Stations

| Station<br>Number | Total         |                   | Total                 |  |
|-------------------|---------------|-------------------|-----------------------|--|
|                   | <u>Metals</u> | <u>Inorganics</u> | <u>Radiochemicals</u> |  |
| SED004            | 4             | 4                 | 4                     |  |
| SED016            | 2             | 2                 | 2                     |  |
| SED017            | 2             | 2                 | 2                     |  |
| SED018            | 1             | 1                 | 2                     |  |
| SED019            | 2             | 2                 | 2                     |  |
| SED020            | 2             | 2                 | 2                     |  |
| SED021            | 2             | 2                 | 2                     |  |
| SED022            | 2             | 2                 | 1                     |  |
| SED023            | 2             | 2                 | 2                     |  |

Total Metal Concentrations for 1989 Background Sediment Stations  
(Concentration units mg/kg)

page 1

| Station Number | Date Sampled | Aluminum (Al) | Antimony (Sb) | Arsenic (As) | Barium (Ba) | Beryllium (Be) | Cadmium (Cd) | Calcium (Ca) | Cesium (Cs) | Chromium (Cr) | Cobalt (Co) | Copper (Cu) | Iron (Fe) | Lead (Pb) | Lithium (Li) |
|----------------|--------------|---------------|---------------|--------------|-------------|----------------|--------------|--------------|-------------|---------------|-------------|-------------|-----------|-----------|--------------|
| =====          | =====        | =====         | =====         | =====        | =====       | =====          | =====        | =====        | =====       | =====         | =====       | =====       | =====     | =====     | =====        |
| 1 SED004       | 02/21/89     | 1             | 6850          | 40 1 U       | 3 U         | 134 U          | 3 3 U        | 3 3 U        | 3340 U      | 669 U         | 30 4        | 33 4 U      | 22        | 15000     | 5.9          |
| 2 SED004       | 02/21/89     | 1             | 3070          | 14 8 U       | 2.2 U       | 49.3 U         | 1 2 U        | 1 2 U        | 1230 U      | 247 U         | 11          | 12 3 U      | 7 7       | 6900      | 14 4         |
| 3 SED004       | 10/27/89     | 4             | 4220          | 12 3 U       | 1 9 U       | 40 9 U         | 1 U          | 1 U          | 1020 U      | 204 U         | 4 6         | 10 2 U      | 5 1 U     | 4200      | 4 4          |
| 4 SED004       | 10/27/89     | 4             | 3100          | 12 1 U       | 2 U         | 40.4 U         | 1 U          | 1 U          | 1010 U      | 202 U         | 4 7         | 10 1 U      | 5 U       | 5790      | 6 2          |
| 5 SED016       | 02/23/89     | 1             | 815 V         | 15 4 UA      | 2.2 UA      | 51 3 UR        | 1 3 UV       | 1 3 UR       | 1280 UV     | 257 UV        | 3 5 A       | 12 8 UA     | 6.4 UV    | 2290 V    | 3 4 A        |
| 6 SED016       | 10/30/89     | 4             | 811           | 13 1 U       | 2.2 U       | 43.8 U         | 1 1 U        | 1 1 U        | 1090 U      | 219 U         | 2 2 U       | 10.9 U      | 5.5 U     | 2550      | 2 7          |
| 7 SED017       | 02/23/89     | 1             | 549 V         | 15 UA        | 2 UA        | 50 UR          | 1 2 UV       | 1 2 UR       | 1250 UV     | 250 UV        | 3 6 A       | 12.5 UA     | 6 2 UV    | 2280 V    | 2 3 A        |
| 8 SED017       | 10/30/89     | 4             | 939           | 12 9 U       | 2 3 U       | 43.1 U         | 1 1 U        | 1 1 U        | 1080 U      | 215 U         | 2 2 U       | 10.8 U      | 5 4 U     | 2200      | 2 1          |
| 9 SED018       | 02/23/89     | 1             | 8080 V        | 38 8 UA      | 5 UA        | 182 A          | 3 2 UV       | 3 2 UR       | 11100 V     | 647 UV        | 15 3 A      | 32 4 UA     | 14 6 UV   | 7490 V    | 49.1 A       |
| 10 SED019      | 02/23/89     | 1             | 21600 V       | 42 1 UA      | 13 A        | 140 UA         | 3 5 UV       | 3 5 UR       | 9220 V      | 702 UV        | 22 5 A      | 35 1 UA     | 20.2 A    | 2250 V    | 23 A         |

| Station Number | Date Sampled | Magnesium (Mg) | Manganese (Mn) | Mercury (Hg) | Molybdenum (Mo) | Nickel (Ni) | Potassium (K) | Selenium (Se) | Silver (Ag) | Sodium (Na) | Strontium (Sr) | Thallium (Tl) | Tin (Sn) | Vanadium (V) | Zinc (Zn) |
|----------------|--------------|----------------|----------------|--------------|-----------------|-------------|---------------|---------------|-------------|-------------|----------------|---------------|----------|--------------|-----------|
| =====          | =====        | =====          | =====          | =====        | =====           | =====       | =====         | =====         | =====       | =====       | =====          | =====         | =====    | =====        | =====     |
| 1 SED004       | 02/21/89     | 3340 U         | 303            | .34 U        | 66.9 U          | 26.8 U      | 3340 U        | 1 5 U         | 6 7 U       | 3340 U      | 66 9 U         | 3 U           | 66 9 U   | 33 4 U       | 70.3      |
| 2 SED004       | 02/21/89     | 1230 U         | 139            | .12 U        | 24 7 U          | 9.9 U       | 1230 U        | 1 1 U         | 2 5 U       | 1230 U      | 24.7 U         | 2 2 U         | 24 7 U   | 12 9 U       | 26        |
| 3 SED004       | 10/27/89     | 1020 U         | 352            | .1 U         | 20 4 U          | 8 2 U       | 1020 U        | .97 U         | 2 U         | 1020 U      | 204 U          | 1 9 U         | 20 4 U   | 24 3         | 49 9      |
| 4 SED004       | 10/27/89     | 1010 U         | 202            | .1 U         | 20 2 U          | 8 1 U       | 1010 U        | 1 U           | 2 U         | 1010 U      | 202 U          | 2 U           | 20 2 U   | 12 8         | 76 4      |
| 5 SED016       | 02/23/89     | 1280 UA        | 139 V          | .13 UA       | 25.7 UV         | 10 3 UR     | 1280 UA       | 1 1 UA        | 2.6 UR      | 1280 UV     | 25 7 UV        | 2 2 UR        | 25 7 UV  | 12 8 UR      | 8 7 A     |
| 6 SED016       | 10/30/89     | 1090 U         | 128            | .093 U       | 21.9 U          | 8 8 U       | 1090 U        | 1 1 U         | 2.2 U       | 1090 U      | 219 U          | 2 2 U         | 21 9 U   | 10 9 U       | 42 4      |
| 7 SED017       | 02/23/89     | 1250 UA        | 179 V          | .12 UA       | 25 UV           | 10 UA       | 1250 UA       | 1 UA          | 2 5 UR      | 1250 UV     | 25 UV          | 2 UV          | 25 UV    | 12 5 UR      | 9 3 A     |
| 8 SED017       | 10/30/89     | 1080 U         | 235            | 11 U         | 21.5 U          | 8 6 U       | 1080 U        | 1 1 U         | 2 2 U       | 1080 U      | 215 U          | 2 3 U         | 21 5 U   | 10 8 U       | 27.7      |
| 9 SED018       | 02/23/89     | 1960 UV        | 57.3 V         | .32 UA       | 64 7 UV         | 25.9 UA     | 3240 UA       | 2 5 UA        | 6 5 UR      | 3240 UV     | 74 2 V         | 5 UR          | 64 7 UV  | 32 4 UA      | 37 2 V    |
| 10 SED019      | 02/23/89     | 4110 V         | 180 V          | 35 UA        | 70.2 UV         | 29 9 A      | 3510 UA       | 2 4 UA        | 7 UR        | 3510 UV     | 70 2 UV        | 48 UR         | 70 2 UV  | 50 2 V       | 48 3 V    |

U=Analyzed but not detected      J=Present below detection limit      E=Estimated value      . =Missing  
A=Acceptable with qualifications      V=Valid and acceptable      R=Rejected      Qtr=Quarter

Total Metal Concentrations for 1989 Background Sediment Stations  
(Concentration units mg/kg)

page 2

| Station Number | Date Sampled | Aluminum (Al) | Antimony (Sb) | Arsenic (As) | Barium (Ba) | Beryllium (Be) | Cadmium (Cd) | Calcium (Ca) | Cesium (Cs) | Chromium (Cr) | Cobalt (Co) | Copper (Cu) | Iron (Fe) | Lead (Pb) | Lithium (Li) |
|----------------|--------------|---------------|---------------|--------------|-------------|----------------|--------------|--------------|-------------|---------------|-------------|-------------|-----------|-----------|--------------|
| =====          | =====        | =====         | =====         | =====        | =====       | =====          | =====        | =====        | =====       | =====         | =====       | =====       | =====     | =====     | =====        |
| 11 SED019      | 10/30/89     | 6440          | 20.6 U        | 6.5          | 68.6 U      | 1.7 U          | 1.7 U        | 5370         | 343 U       | 9.5           | 17.1 U      | 8.6 U       | 7970      | 28.1      | 34.3 U       |
| 12 SED020      | 02/22/89     | 1620 V        | 14.1 UA       | 2 UA         | 47 UV       | 1.2 UV         | 1.2 UV       | 1180 UA      | 235 UV      | 2.4 UA        | 11.8 UA     | 5.9 UA      | 1040 V    | 3.1 V     | 23.5 UV      |
| 13 SED020      | 10/27/89     | 2260          | 23.8 U        | 4.2 U        | 79.4 U      | 2 U            | 2 U          | 1990 U       | 397 U       | 4 U           | 19.9 U      | 9.9 U       | 2300      | 6.2       | 39.7 U       |
| 14 SED021      | 02/22/89     | 7110 V        | 21.4 UA       | 2.2 UA       | 171 V       | 1.8 UV         | 1.8 UV       | 52500 V      | 357 UV      | 19.5 V        | 17.9 UA     | 14.3 A      | 10600 V   | 8.1 V     | 35.7 UV      |
| 15 SED021      | 10/27/89     | 11446         | 15.6 U        | 3.4          | 130         | 1.3 U          | 1.3 U        | 18430        | 260 U       | 13.1          | 13 U        | 13.2        | 11600     | 20.8      | 26 U         |
| 16 SED022      | 02/22/89     | 4560 V        | 13.7 UA       | 2.2 UA       | 56.2 V      | 1.1 UV         | 1.1 UV       | 3870 V       | 228 UV      | 16.5 V        | 11.4 UA     | 8.6 A       | 7920 V    | 25.1 V    | 22.8 UV      |
| 17 SED022      | 10/27/89     | 3130          | 12.5 U        | 3.2          | 41.6 U      | 1 U            | 1 U          | 2010         | 208 U       | 5.9           | 10.4 U      | 5.2 U       | 7710      | 10.6      | 20.8 U       |
| 18 SED023      | 02/21/89     |               | 17 U          | 2 U          | 82.1        | 1.4 U          | 1.4 U        | 1810         | 283 U       | 10.8          | 14.1 U      | 7.1 U       | 9110      | 6.5       | 28.3 U       |
| 19 SED023      | 10/30/89     | 7070          | 16.3 U        | 2.7 U        | 74.4        | 1.4 U          | 1.4 U        | 1570         | 272 U       | 10.9          | 13.6 U      | 6.8 U       | 8890      | 9         | 27.2 U       |

| Station Number | Date Sampled | Magnesium (Mg) | Manganese (Mn) | Mercury (Hg) | Molybdenum (Mo) | Nickel (Ni) | Potassium (K) | Selenium (Se) | Silver (Ag) | Sodium (Na) | Strontium (Sr) | Thallium (Tl) | Tin (Sn) | Vanadium (V) | Zinc (Zn) |
|----------------|--------------|----------------|----------------|--------------|-----------------|-------------|---------------|---------------|-------------|-------------|----------------|---------------|----------|--------------|-----------|
| =====          | =====        | =====          | =====          | =====        | =====           | =====       | =====         | =====         | =====       | =====       | =====          | =====         | =====    | =====        | =====     |
| 11 SED019      | 10/30/89     | 1710 U         | 34.9           | .18 U        | 34.3 U          | 13.7 U      | 1710 U        | 1.7 U         | 3.4 U       | 1710 U      | 343 U          | 3.5 U         | 34.3 U   | 22.9         | 47.7      |
| 12 SED020      | 02/22/89     | 1180 UA        | 9 V            | 12 UA        | 23.5 UV         | 9.4 UA      | 1180 UA       | .98 UA        | 2.4 UV      | 1180 UV     | 23.5 UV        | 2 UR          | 23.5 UV  | 11.8 UV      | 6.5 A     |
| 13 SED020      | 10/27/89     | 1990 U         | 16.8           | 21 U         | 39.7 U          | 15.9 U      | 1990 U        | 2.1 U         | 4 U         | 1990 U      | 397 U          | 4.2 U         | 39.7 U   | 19.9 U       | 55.6      |
| 14 SED021      | 02/22/89     | 2490 A         | 105 V          | .19 UA       | 35.7 UV         | 14.3 UA     | 1790 UA       | 1.1 UA        | 6.8 V       | 1790 UV     | 175 V          | 2.2 UR        | 35.7 UV  | 17.9 UV      | 43.2 A    |
| 15 SED021      | 10/27/89     | 2330           | 139            | .14 U        | 26 U            | 12.7        | 1340          | 1.3 U         | 2.6 U       | 1300 U      | 260 U          | 2.6 U         | 26 U     | 26.2         | 79.8      |
| 16 SED022      | 02/22/89     | 1380 A         | 95.2 V         | .12 UA       | 22.8 UV         | 9.9 A       | 1140 UA       | 1.1 UA        | 2.3 UV      | 1140 UV     | 25.2 V         | 2.2 UR        | 22.8 UV  | 13.4 V       | 35.7 A    |
| 17 SED022      | 10/27/89     | 1040 U         | 118            | .11 U        | 20.8 U          | 8.3 U       | 1040 U        | 1 U           | 2.1 U       | 1040 U      | 208 U          | 2 U           | 20.8 U   | 12.7         | 41.7      |
| 18 SED023      | 02/21/89     | 1530           | 97             | 14 U         | 28.3 U          | 14.2        | 1410 U        | 1 U           | 2.8 U       | 1410 U      | 28.3 U         | 2 U           | 28.3 U   | 20.6         | 22.8      |
| 19 SED023      | 10/30/89     | 1360 U         | 52.8           | 14 U         | 27.2 U          | 10.9 U      | 1360 U        | 1.3 U         | 2.7 U       | 1360 U      | 272 U          | 2.7 U         | 27.2 U   | 24.3         | 42.6      |

U=Analyzed but not detected J=Present below detection limit E=Estimated value =Missing  
A=Acceptable with qualifications V=Valid and acceptable R=Rejected Qtr=Quarter

Inorganic Concentrations for 1989 Background Sediment Stations  
(Concentration units mg/kg except pH)

page 1

| Station<br>Number | Date<br>Sampled | Qtr | Nitrate/Nitrite |  | pH      |  |
|-------------------|-----------------|-----|-----------------|--|---------|--|
|                   |                 |     | as N            |  | pH unit |  |
| SED004            | 02/21/89        | 1   | 1 3 U           |  | 7       |  |
| SED004            | 02/21/89        | 1   | 1 3 U           |  | 7 2     |  |
| SED004            | 10/27/89        | 4   | 1 1 V           |  | 8 2     |  |
| SED004            | 10/27/89        | 4   | 1 1 V           |  | 8 1     |  |
| SED016            | 02/23/89        | 1   | 1 4 UV          |  | 7 3 V   |  |
| SED016            | 10/30/89        | 4   | 1.2 UV          |  | 7 7     |  |
| SED017            | 02/23/89        | 1   | 1 4 UV          |  | 7.3 V   |  |
| SED017            | 10/30/89        | 4   | 1 2 UV          |  | 7       |  |
| SED018            | 02/23/89        | 1   | 2 9 UV          |  | 6 9 V   |  |
| SED019            | 02/23/89        | 1   | 1 8 UV          |  | 7 V     |  |
| SED019            | 10/30/89        | 4   | 2 1 UV          |  | 7 3     |  |
| SED020            | 02/22/89        | 1   | 1 4 U           |  | 7 7     |  |
| SED020            | 10/27/89        | 4   | 3 7 UV          |  | 7 9     |  |
| SED021            | 02/22/89        | 1   | 2.7 U           |  | 7.9     |  |
| SED021            | 10/27/89        | 4   | 13 V            |  | 7 9     |  |
| SED022            | 02/22/89        | 1   | 2 1 U           |  | 7.7     |  |
| SED022            | 10/27/89        | 4   | 1 6 V           |  | 8 7     |  |
| SED023            | 02/21/89        | 1   | 1 4 U           |  | 6.1     |  |
| SED023            | 10/30/89        | 4   | 1 2 UV          |  | 6.8     |  |

U=Analyzed but not detected J=Present below detection limit E=Estimated value =Missing  
A=Acceptable with qualifications V=Valid and acceptable R=Rejected Qtr=Quarter

Total Radiochemical Concentrations for 1989 Background Sediment Stations  
(Concentration units pCi/g except Tritium units pCi/ml)

page 1

| Station Number | Date Sampled | Qtr | Gross Alpha | Gross Beta | Uranium 233,234 | Uranium 235 | Uranium 238 | Strontium 89,90 | Plutonium 239 | Americium 241 | Cesium 137 | Radium 226 | Radium 228 | Tritium |
|----------------|--------------|-----|-------------|------------|-----------------|-------------|-------------|-----------------|---------------|---------------|------------|------------|------------|---------|
| SED004         | 02/21/89     | 1   | 25+13       | 35+6       | 1.1+3           | 0+1         | 1+2         | 6+9             | 0+02          | 01+03         | 0+1        | 8+1        | 1 6+3      | .2+15   |
| SED004         | 02/21/89     | 1   | 48+16       | 33+6       | 1+2             | 1+1         | 1+2         | 0+8             | 0+02          | -01+02        | 0+1        | 8+1        | 1 4+2      | 09+14   |
| SED004         | 10/27/89     | 4   |             |            | 1 03+ .         | .03+ .      | 89+ .       | -.12+ .         | .07+ .        |               | 6+ .       | 8+ .       | 1 4+ .     | 41+ .   |
| SED004         | 10/27/89     | 4   |             |            | 38+ .           | .02+ .      | 39+ .       | .29+ .          | .01+ .        |               | 0+ .       | 6+ .       | 1 3+ .     | 33+ .   |
| SED016         | 02/23/89     | 1   | 20+13       | 39+6       | .5+2            | 0+1         | 6+2         | -2+6            | 0+02          | -01+02        | 0+1        | 7+1        | 1 5+3      | 13+14   |
| SED016         | 10/30/89     | 4   | 10 2+ .     | 31 5+ .    | 1 2+ .          | 1.34+ .     | 4+ .        | 35+ .           | 0+ .          |               | 0+ .       | 9+ .       | 1 2+ .     | -2+ .   |
| SED017         | 02/23/89     | 1   | 31+15       | 40+7       | 5+1             | 1+1         | 5+1         | -6+7            | 01+02         | -01+02        | 0+1        | 7+1        | 1 1+1      | 2+14    |
| SED017         | 10/30/89     | 4   | 7 7+ .      | 41.9+ .    | 41+ .           | 03+ .       | 42+ .       | 29+ .           | 0+ .          |               | 59+ .      | 9+ .       | 1+ .       | -25+ .  |
| SED018         | 02/23/89     | 1   | 35+14       | 23+6       | 7+2             | 0+1         | .5+2        | -2+6            | .03+02        | 02+04         | 4+1        | 8+1        | 1 2+2      | 12+14   |
| SED018         | 10/30/89     | 4   | 6 2+ .      | 15.3+ .    | .55+ .          | .1+ .       | 3+ .        | 39+ .           | 02+ .         |               | 9+ .       | .9+ .      | 1 6+ .     | -32+ .  |
| SED019         | 02/23/89     | 1   | 39+15       | 29+6       | .9+2            | 1+1         | 1 1+2       | 4+7             | 04+03         | 0+02          | 1 4+1      | .8+1       | 1+1        | 18+14   |
| SED019         | 10/30/89     | 4   | 13 9+ .     | 10 8+ .    | 1.48+ .         | .78+ .      | 52+ .       | 19+ .           | 03+ .         |               | 3 2+ .     | 5+ .       | 1 4+ .     | 75+ .   |
| SED020         | 02/22/89     | 1   | 4+12        | 20+6       | 5+1             | 0+1         | .4+1        | -.1+4           | 0+02          | -.01+02       | 0+1        | .6+1       | 1 1+2      | 31+15   |
| SED020         | 10/27/89     | 4   |             |            | 44+ .           | 04+ .       | .45+ .      | 02+ .           | 01+ .         |               | 1.9+ .     | .9+ .      | 1 3+ .     | -81+ .  |
| SED021         | 02/22/89     | 1   | 24+15       | 24+6       | 1.2+1           | 0+1         | 1 1+1       | 8+7             | .08+02        | 0+02          | .4+1       | .7+1       | 1 1+2      | 32+15   |
| SED021         | 10/27/89     | 4   |             |            | .78+ .          | .05+ .      | 85+ .       | 25+ .           | 01+ .         |               | .9+ .      | 1+ .       | 1 8+ .     | .48+ .  |
| SED022         | 02/22/89     | 1   | 13+13       | 25+6       | 6+1             | 0+1         | 5+1         | 1+5             | 01+02         | 0+02          | 0+1        | .7+1       | 1+2        | 15+14   |
| SED023         | 02/21/89     | 1   | 40+15       | 31+6       | 1 2+2           | .1+1        | 1 3+2       | 3+7             | .01+02        | -01+02        | 0+1        | 1+1        | 2.1+4      | 22+15   |
| SED023         | 10/27/89     | 4   | 11 2+ .     | 31.7+ .    | .43+ .          | .2+ .       | 66+ .       | 99+ .           | 0+ .          |               | 55+ .      | 1.1+ .     | 2.3+ .     | .97+ .  |

The table format is: concentration + counting error Qtr=Quarter Qtr=Missing data

Total Samples, by analyte group, for 1989 Background Surface Water Stations

page 1

| <u>Station<br/>Number</u> | <u>Total<br/>Metals</u> | <u>Dissolved<br/>Metals</u> | <u>Inorganics</u> | <u>Total<br/>Radiochemicals</u> | <u>Dissolved<br/>Radiochemicals</u> | <u>Field<br/>Parameters</u> |
|---------------------------|-------------------------|-----------------------------|-------------------|---------------------------------|-------------------------------------|-----------------------------|
| SW004                     | 2                       | 2                           | 2                 | 2                               | 1                                   | 2                           |
| SW005                     | 8                       | 8                           | 9                 | 7                               | 1                                   | 9                           |
| SW006                     | 10                      | 11                          | 14                | 10                              | 2                                   | 14                          |
| SW007                     | 4                       | 4                           | 4                 | 3                               | 1                                   | 4                           |
| SW041                     | 5                       | 5                           | 5                 | 4                               | 1                                   | 5                           |
| SW080                     | 6                       | 6                           | 7                 | 6                               | 1                                   | 8                           |
| SW104                     | 9                       | 10                          | 10                | 8                               | 1                                   | 10                          |
| SW107                     | 6                       | 6                           | 8                 | 5                               | 1                                   | 7                           |
| SW108                     | 6                       | 6                           | 6                 | 5                               | 1                                   | 6                           |

Total Metal Concentrations for 1989 Background Surface Water Stations  
(Concentration units mg/L)

page 1

| Station Number | Date Sampled   | Aluminum (Al) | Antimony (Sb) | Arsenic (As) | Barium (Ba) | Beryllium (Be) | Cadmium (Cd) | Calcium (Ca) | Cesium (Cs) | Chromium (Cr) | Cobalt (Co) | Copper (Cu) | Iron (Fe) | Lead (Pb) | Lithium (Li) |
|----------------|----------------|---------------|---------------|--------------|-------------|----------------|--------------|--------------|-------------|---------------|-------------|-------------|-----------|-----------|--------------|
| 1              | SW004 03/02/89 | 2 UA          | .06 UR        | .01 UV       | 2 UV        | .005 UA        | .005 UR      | 35 1 V       | 1 UV        | .01 UR        | 05 UR       | .025 UV     | .118 V    | 005 UA    | 1 UV         |
| 2              | SW004 06/15/89 | .2 U          | .06 U         | .01 U        | 2 U         | .005 U         | .005 U       | 33 9         | 1 U         | .01 U         | 05 U        | .025 U      | 209       | 005 U     | 1 U          |
| 3              | SW005 02/28/89 | 2 UR          | .06 UR        | .01 UA       | 2 UV        | .005 UA        | .005 UV      | 24 2 V       | 1 UV        | 01 UR         | 05 UV       | .025 UV     | .124 V    | 005 UA    | 1 UV         |
| 4              | SW005 06/09/89 | .2 UA         | .06 UV        | .01 UV       | 2 UA        | .005 UA        | .005 UR      | 12 1 A       | 1 UV        | .0135 A       | 05 UA       | .025 UR     | .481 V    | 005 UA    | 1 UV         |
| 5              | SW005 07/13/89 | 2 UV          | .06 UA        | .01 UV       | 2 UV        | .005 UV        | .005 UV      | 23 3 V       | 1 UV        | 01 UV         | 05 UV       | .025 UA     | 323 V     | 005 UA    | 1 UA         |
| 6              | SW005 08/01/89 | 2 UA          | .06 UV        | .01 UV       | 2 UV        | .005 UV        | .005 UV      | 22 8 V       | 1 UV        | .01 UV        | 05 UV       | .025 UA     | 182 A     | 005 UA    | 1 UV         |
| 7              | SW005 09/05/89 | .2 U          | .06 U         | .01 U        | 2 U         | .005 U         | .005 U       | 21 6         | 1 U         | 01 U          | 05 U        | .025 U      | 1 U       | 005 U     | 1 U          |
| 8              | SW005 10/02/89 | .0758 V       | 5 UV          | .002 UV      | .0513 V     | .002 UV        | .004 UV      | 24 2 V       | 1 UV        | 02 UV         | 02 UR       | .02 UV      | 132 V     | 002 UV    | 008 V        |
| 9              | SW005 11/01/89 | 0599          | 5 U           | .002 U       | .0594       | .002 U         | .004 U       | 24 5         | 1 U         | 02 U          | 02 U        | .02 U       | 0855      | 002 U     | 009          |
| 10             | SW005 12/04/89 | 2 U           | .06 U         | .01 U        | 2 U         | .005 U         | .005 U       | 23 4         | 2 5 U       | 01 U          | 05 U        | .025 U      | .1 U      | 003 U     | 1 U          |
| 11             | SW006 02/24/89 | 916           | .06 U         | .01 U        | 2 U         | .005 U         | .005 U       | 26 2         | 1 U         | .01 U         | 05 U        | .025 U      | 2 41      | 005 U     | .1 U         |
| 12             | SW006 02/24/89 | 1 06 R        | .06 UR        | .01 UA       | 2 UA        | .005 UA        | .005 UV      | 24.1 V       | 1 UV        | 01 UR         | 05 UA       | .025 UV     | 2 21 A    | 005 UA    | 1 UV         |

| Station Number | Date Sampled   | Magnesium (Mg) | Manganese (Mn) | Mercury (Hg) | Molybdenum (Mo) | Nickel (Ni) | Potassium (K) | Selenium (Se) | Silver (Ag) | Sodium (Na) | Strontium (Sr) | Thallium (Tl) | Tin (Sn) | Vanadium (V) | Zinc (Zn) |
|----------------|----------------|----------------|----------------|--------------|-----------------|-------------|---------------|---------------|-------------|-------------|----------------|---------------|----------|--------------|-----------|
| 1              | SW004 03/02/89 | 7.82 A         | .015 UA        | .0002 R      | 1 UV            | .04 UR      | 5 UA          | .005 UA       | .01 UA      | 21 9 V      | 194 V          | .05 UA        | .1 UV    | 05 UA        | 02 UV     |
| 2              | SW004 06/15/89 | 7 7            | .015 U         | .0014        | 1 U             | .04 U       | 5 U           | .005 U        | .01 U       | 25.5        | 1 U            | .04 U         | 1 U      | 05 U         | 118       |
| 3              | SW005 02/28/89 | 5 76 V         | .015 UA        | .0004 A      | 1 UV            | .04 UA      | 5 UA          | .005 UA       | .01 UV      | 15 3 V      | 14 V           | .01 UA        | 1 UV     | 05 UV        | .02 UA    |
| 4              | SW005 06/09/89 | 5 UA           | .015 UV        | .0002 UV     | 1 UV            | .04 UA      | 5 UA          | .005 UV       | .01 UR      | 13 2 V      | 1 UV           | .01 UA        | 1 UV     | 05 UR        | 0216 A    |
| 5              | SW005 07/13/89 | 5 UV           | .015 UV        | .0002 UR     | .1 UA           | .04 UA      | 5 UR          | .005 UR       | .01 UA      | 13 7 V      | 1 UA           | .01 UV        | 1 UA     | 05 UV        | 0619 V    |
| 6              | SW005 08/01/89 | 5 UV           | .015 UV        | .0002 UV     | 1 UV            | .04 UV      | 5 UA          | .005 UA       | .01 UA      | 12 7 A      | 1 UV           | .01 UV        | 1 UV     | 05 UA        | 0224 A    |
| 7              | SW005 09/05/89 | 5 U            | .015 U         | .0003        | 1 U             | .04 U       | 5 U           | .005 U        | .01 U       | 13.1        | 1 U            | .01 U         | 1 U      | 05 U         | 272       |
| 8              | SW005 10/02/89 | 4 77 V         | .01 UA         | .0002 UA     | 5 UV            | .02 UV      | 1.03 A        | .002 UV       | .03 UV      | 12 9 V      | 149            | .003 UV       | 1 UV     | 01 UV        | 0259 A    |
| 9              | SW005 11/01/89 | 5 09           | .0147          | .0002 U      | 5 U             | .02 U       | 2.33          | .002 U        | .03 U       | 13 8        | 148            | .003 U        | 1 U      | 01 U         | 0111      |
| 10             | SW005 12/04/89 | 5              | .015 U         | .0002 U      | 1 U             | .04 U       | 5 U           | .005 U        | .01 U       | 13 5        | 159            | .01 U         | 1 U      | 05 U         | 0296      |
| 11             | SW006 02/24/89 | 8              | 378            | .0002 U      | 1 U             | .04 U       | 5 U           | .005 U        | .01 U       | 30 2        | 177            | .01 U         | 1 U      | 05 U         | 0268      |
| 12             | SW006 02/24/89 | 7.63 V         | 371 A          | .0002 UV     | 1 UV            | .04 UA      | 5 UA          | .005 UA       | .01 UA      | 27 8 V      | 171 V          | .01 UA        | 1 UV     | 05 UV        | 0536 V    |

U=Analyzed but not detected J=Present below detection limit E=Estimated value =Missing  
A=Acceptable with qualifications V=Valid and acceptable R=Rejected qtr=Quarter

Total Metal Concentrations for 1989 Background Surface Water Stations  
(Concentration units mg/L)

page 2

| Station Number | Date Sampled | Aluminum (Al) | Antimony (Sb) | Arsenic (As) | Barium (Ba) | Beryllium (Be) | Cadmium (Cd) | Calcium (Ca) | Cesium (Cs) | Chromium (Cr) | Cobalt (Co) | Copper (Cu) | Iron (Fe) | Lead (Pb) | Lithium (Li) |
|----------------|--------------|---------------|---------------|--------------|-------------|----------------|--------------|--------------|-------------|---------------|-------------|-------------|-----------|-----------|--------------|
| =====          | =====        | =====         | =====         | =====        | =====       | =====          | =====        | =====        | =====       | =====         | =====       | =====       | =====     | =====     | =====        |
| 13 SW006       | 05/31/89     | 2 1 67 V      | .06 UV        | .01 UV       | .2 UV       | .005 UA        | .005 UA      | 16 3 V       | 1 UV        | .0106 A       | .05 UV      | .025 UV     | 1 64 V    | .005 UA   | .01 UV       |
| 14 SW006       | 06/08/89     | 2 1 38 V      | .06 UV        | .01 UA       | .2 UV       | .005 UA        | .005 UV      | 19 5 V       | 1 UV        | .01 UV        | .05 UV      | .0255 A     | 1 16 V    | .005 UR   | 1 UA         |
| 15 SW006       | 08/01/89     | 3 2 96 V      | .06 UV        | .01 UV       | 2 UV        | .005 UV        | .005 UV      | 19 5 V       | 1 UV        | .01 UV        | .05 UV      | .025 UA     | 4 09 A    | .005 UA   | 1 UV         |
| 16 SW006       | 09/05/89     | 3 2 U         | .06 U         | .01 U        | .2 U        | .005 U         | .005 U       | 15 2         | 1 U         | .01 U         | .05 U       | .025 U      | .465      | .005 U    | 1 U          |
| 17 SW006       | 09/05/89     | 3 2 U         | .06 U         | .01 U        | 2 U         | .005 U         | .005 U       | 15 6         | 1 U         | .01 U         | .05 U       | .025 U      | .484      | .005 U    | 1 U          |
| 18 SW006       | 10/02/89     | 4 .0691 V     | .5 UV         | .002 UV      | .05 UV      | .002 UR        | .004 UV      | 11 V         | 1 UV        | .02 UV        | .02 UR      | .02 UV      | 595 V     | .0052 A   | .003 V       |
| 19 SW006       | 11/01/89     | 4 105         | 5 U           | .002 U       | .05 U       | .002 U         | .004 U       | 12           | 1 U         | .02 U         | .02 U       | .02 U       | 488       | .0041     | .004         |
| 20 SW006       | 12/04/89     | 4 252         | .06 U         | .01 U        | 2 U         | .005 U         | .005 U       | 11 7         | 2 5 U       | .01 U         | .05 U       | .025 U      | .601      | .003 U    | 1 U          |
| 21 SW007       | 02/27/89     | 1 2 U         | .06 U         | .01 U        | 2 U         | .005 U         | .005 U       | 14 8         | 1 U         | .01 U         | .05 U       | .025 U      | 185       | .005 U    | 1 U          |
| 22 SW007       | 05/31/89     | 2 1 21 V      | .06 UV        | .01 UV       | 2 UV        | .005 UA        | .005 UA      | 26 2 V       | 1 UV        | .01 UA        | .05 UV      | .025 UV     | 946 V     | .005 UA   | .01 UV       |
| 23 SW007       | 06/08/89     | 2 407 A       | .06 UV        | .01 UR       | .2 UV       | .005 UA        | .005 UV      | 24 3 V       | 1 UV        | .01 UV        | .05 UV      | .025 UV     | 452 V     | .005 UR   | 1 UA         |
| 24 SW007       | 08/01/89     | 3 582         | .06 U         | .01 U        | 2 U         | .005 U         | .005 U       | 19 8         | 1 U         | .01 U         | .05 U       | .025 U      | 686       | .005 U    | 1 U          |

| Station Number | Date Sampled | Magnesium (Mg) | Manganese (Mn) | Mercury (Hg) | Molybdenum (Mo) | Nickel (Ni) | Potassium (K) | Selenium (Se) | Silver (Ag) | Sodium (Na) | Strontium (Sr) | Thallium (Tl) | Tin (Sn) | Vanadium (V) | Zinc (Zn) |
|----------------|--------------|----------------|----------------|--------------|-----------------|-------------|---------------|---------------|-------------|-------------|----------------|---------------|----------|--------------|-----------|
| =====          | =====        | =====          | =====          | =====        | =====           | =====       | =====         | =====         | =====       | =====       | =====          | =====         | =====    | =====        | =====     |
| 13 SW006       | 05/31/89     | 5 UV           | .0848 V        | .0003 A      | .0106 A         | .04 UA      | 5 UA          | .005 UA       | .01 UV      | 22 V        | 1 UA           | .01 UA        | 1 UA     | .05 UA       | .0676 V   |
| 14 SW006       | 06/08/89     | 4 83 V         | .0965 V        | .0002 UV     | .1 UV           | .04 UV      | 5 UA          | .005 UA       | .01 UV      | 18.9 V      | 135 A          | .01 UV        | 1 UV     | .05 UV       | .181 V    |
| 15 SW006       | 08/01/89     | 5 33 V         | 108 V          | .0002 UV     | .1 UV           | .04 UV      | 5 UA          | .005 UA       | .01 UA      | 23 6 A      | 1 UV           | .01 UV        | 1 UV     | .05 UA       | .149 V    |
| 16 SW006       | 09/05/89     | 5.12           | .0294          | .0002 U      | .1 U            | .04 U       | 5 U           | .005 U        | .01 U       | 23          | 1 U            | .01 U         | .1 U     | .05 U        | .345      |
| 17 SW006       | 09/05/89     | 5 25           | .0288          | .0002 U      | .1 U            | .04 U       | 5 U           | .005 U        | .01 U       | 25.7        | 1 U            | .01 U         | .1 U     | .05 U        | .363      |
| 18 SW006       | 10/02/89     | 3 06 V         | .0302 V        | .0002 UA     | 5 UV            | .02 UV      | 2 42 V        | .002 UV       | .03 UV      | 14 5 V      | .0772          | .003 UV       | 1 UV     | .01 UV       | .0261 A   |
| 19 SW006       | 11/01/89     | 3.66           | .0258          | .0002 U      | 5 U             | .02 U       | 2 53          | .002 U        | .03 U       | 16.5        | .0832          | .003 U        | 1 U      | .01 U        | .0156     |
| 20 SW006       | 12/04/89     | 5 U            | .0253          | .0002 U      | .1 U            | .04 U       | 5 U           | .005 U        | .01 U       | 15 9        | .1 U           | .01 U         | .1 U     | .05 U        | .0239     |
| 21 SW007       | 02/27/89     | 5 U            | .015 U         | .0004 U      | 1 U             | .04 U       | 5 U           | .005 U        | .01 U       | 16 1        | .1 U           | .01 U         | 1 U      | .05 U        | .0276     |
| 22 SW007       | 05/31/89     | 6 58 V         | .105 V         | .0003 A      | .0144 A         | .04 UA      | 5 UA          | .005 UA       | .01 UV      | 33 3 V      | 1 UA           | .01 UA        | 1 UA     | .05 UV       | .02 UA    |
| 23 SW007       | 06/08/89     | 5 93 V         | .0324 V        | .0002 UV     | 1 UV            | .04 UV      | 5 UA          | .0053 A       | .01 UV      | 28 1 V      | .154 A         | .01 UV        | 1 UV     | .05 UV       | .103 V    |
| 24 SW007       | 08/01/89     | 5 U            | .0186          | .0002 U      | .1 U            | .04 U       | 5 U           | .005 U        | .01 U       | 27 6        | 1 U            | .01 U         | 1 U      | .05 U        | .139      |

U=Analyzed but not detected      J=Present below detection limit      E=Estimated value      =Missing  
A=Acceptable with qualifications      V=Valid and acceptable      R=Rejected      qtr=Quarter

Total Metal Concentrations for 1989 Background Surface Water Stations  
(Concentration units mg/L)

page 3

| Station Number | Date Sampled   | Aluminum (Al) | Antimony (Sb) | Arsenic (As) | Barium (Ba) | Beryllium (Be) | Cadmium (Cd) | Calcium (Ca) | Cesium (Cs) | Chromium (Cr) | Cobalt (Co) | Copper (Cu) | Iron (Fe) | Lead (Pb) | Lithium (Li) |
|----------------|----------------|---------------|---------------|--------------|-------------|----------------|--------------|--------------|-------------|---------------|-------------|-------------|-----------|-----------|--------------|
| 25             | SW041 03/01/89 | 1             | .06 U         | 01 U         | 2 U         | 005 U          | 005 U        | 21 7         | 1 U         | 01 U          | 05 U        | 025 U       | 132       | 005 U     | 1 U          |
| 26             | SW041 05/26/89 | 2             | 06 U          | 01 U         | 2 U         | 005 U          | 005 U        | 34           | 1 U         | 01 U          | 05 U        | .025 U      | 5 48      | 005 U     | 01 U         |
| 27             | SW041 06/16/89 | 2             | 1 14 V        | 01 UA        | 2 UV        | 005 UR         | 005 UA       | 29 3 V       | 1 UV        | 01 UR         | .05 UV      | 025 UV      | 2.09 V    | .005 UA   | 1 UV         |
| 28             | SW041 11/20/89 | 4             | .06 U         | 01 U         | 2 U         | 005 U          | 005 U        | 26 6         | 2 5 U       | 01 U          | 05 U        | .025 U      | 14 5      | 0082      | 1 U          |
| 29             | SW041 12/05/89 | 4             | 827           | 01 U         | 2 U         | 005 U          | 005 U        | 28 7         | 2 5 U       | 01 U          | 05 U        | .025 U      | 8 18      | 003 U     | 1 U          |
| 30             | SW080 03/01/89 | 1             | 64 1          | 116 V        | 4.49 V      | 0097 A         | 069 R        | 226          | 2 53 V      | 0598 V        | 073 A       | .18 V       | 651       | 233 A     | 1 UV         |
| 31             | SW080 06/16/89 | 2             | 293 V         | 1 03 V       | 4.48 V      | 0107 A         | .0644 V      | 803 V        | 1 UV        | 275 A         | 489 V       | .607 V      | 3220 V    | 516 V     | 1 UV         |
| 32             | SW080 07/14/89 | 3             | 63.4 V        | 517 A        | 4 45 V      | 0088 V         | .0158 V      | 320 V        | 1 UV        | 0722 A        | .088 V      | 177 A       | 898 V     | 465 V     | 1 UV         |
| 33             | SW080 10/13/89 | 4             | 1 86          | 01 U         | 2 U         | 005 U          | 005 U        | 39 6         | 1 U         | 01 U          | 05 U        | .025 U      | 21 4      | 0098      | 1 U          |
| 34             | SW080 11/20/89 | 4             | 12 1          | 0195         | 1 53        | .005 U         | 005 U        | 86 5         | 2 5 U       | 01 U          | 05 U        | 0756        | 180       | 178       | 1 U          |
| 35             | SW080 12/05/89 | 4             | 4 52          | 019          | 391         | 005 U          | 005 U        | 46.6         | 2 5 U       | .01 U         | 05 U        | .025 U      | 47 2      | 0354      | 1 U          |
| 36             | SW104 03/02/89 | 1             | 8.36 V        | 0105 V       | .2 UV       | .005 UA        | .005 UR      | 98 1 A       | 1 UV        | 01 UR         | 05 UR       | .025 UV     | 22 6 V    | 0185 A    | 1 UV         |

| Station Number | Date Sampled   | Magnesium (Mg) | Manganese (Mn) | Mercury (Hg) | Molybdenum (Mo) | Nickel (Ni) | Potassium (K) | Selenium (Se) | Silver (Ag) | Sodium (Na) | Strontium (Sr) | Thallium (Tl) | Tin (Sn) | Vanadium (V) | Zinc (Zn) |
|----------------|----------------|----------------|----------------|--------------|-----------------|-------------|---------------|---------------|-------------|-------------|----------------|---------------|----------|--------------|-----------|
| 25             | SW041 03/01/89 | 6 1            | 0212           | .0011 U      | 1 U             | 04 U        | 5 U           | .005 U        | .01 U       | 30          | 127            | .04 U         | .1 U     | 05 U         | 02 U      |
| 26             | SW041 05/26/89 | 8 81           | 209            | .0002 U      | .0115           | .04 U       | 5 U           | .005 U        | 01 U        | 26.4        | 1 U            | .01 U         | .1 U     | 05 U         | 0892      |
| 27             | SW041 06/16/89 | 7 43 V         | .107 A         | .0002 UV     | .1 UV           | 04 UA       | 5 UR          | .005 UV       | 01 UA       | 21 5 V      | 1 UV           | .01 UA        | 1 UV     | 05 UV        | 106 V     |
| 28             | SW041 11/20/89 | 7 84           | .144           | .0002 U      | 1 U             | 04 U        | 5 U           | .005 U        | .01 U       | 27 3        | 186            | 01 U          | 1 U      | .05 U        | 0285      |
| 29             | SW041 12/05/89 | 7.42           | .0502          | 0002 U       | .1 U            | 04 U        | 5 U           | 005 U         | .01 U       | 24.5        | 19             | 01 U          | 1 U      | 05 U         | 0726      |
| 30             | SW080 03/01/89 | 24 9 V         | .48 A          |              | 199 V           | 25 A        | 9 86 V        | 005 UV        | 148 V       | 12.8 V      | 1 2 V          | .04 UA        | 969 V    | 364 V        | 723 V     |
| 31             | SW080 06/16/89 | 5 UV           | 27 7 A         | 0002 UV      | 1 UV            | 646 V       | 5 UA          | 025 UA        | .01 UR      | 5 UA        | 1 UV           | 01 UA         | 1 UV     | 1 65 V       | 2.68 A    |
| 32             | SW080 07/14/89 | 27 2 V         | 4.94 V         | .0002 UR     | 1 UV            | 095 V       | 10 2 V        | 025 UA        | .01 UV      | 13 5 V      | 1 46 V         | 01 UR         | 635 A    | 484 V        | 736 V     |
| 33             | SW080 10/13/89 | 5 26           | .23            | 0002 U       | 1 U             | 04 U        | 5 U           | 005 U         | .01 U       | 9 82        | 1 U            | 01 U          | 1 U      | 05 U         | 408       |
| 34             | SW080 11/20/89 | 9 6            | 3 59           | 0002 U       | 1 U             | 04 U        | 5 U           | 005 U         | .0341       | 9 44        | 522            | 01 U          | 1 U      | 146          | 125       |
| 35             | SW080 12/05/89 | 5 54           | 1 37           | 0002 U       | 1 U             | 04 U        | 5 U           | 005 U         | 01 U        | 8 36        | 252            | 01 U          | .1 U     | 05 U         | 074       |
| 36             | SW104 03/02/89 | 9 04 A         | 716 A          | 0003 R       | 1 UV            | 04 UR       | 5 UA          | 005 UA        | 0174 A      | 14 4 V      | 255 V          | .05 UA        | 1 UV     | 05 UA        | 0281 A    |

U=Analyzed but not detected J=Present below detection limit E=Estimated value =Missing  
A=Acceptable with qualifications V=Valid and acceptable R=Rejected Qtr=Quarter

Total Metal Concentrations for 1989 Background Surface Water Stations  
(Concentration units mg/L)

page 4

| Station Number | Date Sampled | Aluminum (Al) | Antimony (Sb) | Arsenic (As) | Barium (Ba) | Beryllium (Be) | Cadmium (Cd) | Calcium (Ca) | Cesium (Cs) | Chromium (Cr) | Cobalt (Co) | Copper (Cu) | Iron (Fe) | Lead (Pb) | Lithium (Li) |
|----------------|--------------|---------------|---------------|--------------|-------------|----------------|--------------|--------------|-------------|---------------|-------------|-------------|-----------|-----------|--------------|
| 37 SW104       | 06/01/89     | 2             | 4.02 V        | 01 UV        | 294 V       | 005 UA         | 005 UA       | 69.4 V       | 1 UV        | .0115 A       | .05 UV      | 025 UV      | 7.94 V    | 0308 A    | 01 UV        |
| 38 SW104       | 06/16/89     | 2             | 22.5 V        | .015 V       | 341 V       | 005 UA         | 005 UA       | 61.2 V       | 1 UV        | .0286 A       | .05 UV      | 0333 V      | 29.6 V    | 0845 V    | 1 UV         |
| 39 SW104       | 07/14/89     | 3             | 30.5 V        | .06 UV       | 397 V       | 005 UV         | 005 UV       | 63.4 V       | 1 UV        | .0326 V       | .05 UV      | 0434 V      | 42.4 V    | .119 V    | 1 UV         |
| 40 SW104       | 08/04/89     | 3             | 47.7 V        | .06 UA       | 585 V       | .005 UA        | 005 UV       | 78.6 V       | 1 UV        | .0455 V       | .05 UA      | 051 V       | 61.7 V    | 153 V     | 1 UV         |
| 41 SW104       | 09/19/89     | 3             | 1.38          | .06 U        | 2 U         | 005 U          | 005 U        | 38.8         | 1 U         | .01 U         | .05 U       | 025 U       | 1.62      | 005 U     | 1 U          |
| 42 SW104       | 10/13/89     | 4             | .2 U          | .06 U        | 2 U         | .005 U         | 005 U        | 38.4         | 1 U         | .01 U         | .05 U       | 025 U       | 108       | 005 U     | 1 U          |
| 43 SW104       | 11/20/89     | 4             | 2 U           | .06 U        | 2 U         | .005 U         | 005 U        | 34.7         | 2.5 U       | .01 U         | .05 U       | 025 U       | 332       | 003 U     | 1 U          |
| 44 SW104       | 12/04/89     | 4             | 2 U           | .06 U        | 2 U         | 005 U          | 005 U        | 38.6         | 2.5 U       | .01 U         | .05 U       | 025 U       | 441       | .003 U    | .1 U         |
| 45 SW107       | 02/27/89     | 1             | 2 UR          | .06 UR       | 01 UA       | .005 UA        | 005 UV       | 20 V         | 1 UV        | .01 UR        | .05 UV      | 025 UV      | .149 V    | 005 UA    | 1 UV         |
| 46 SW107       | 05/26/89     | 2             | 236           | .06 U        | 01 U        | 005 U          | .005 U       | 19.1         | 1 U         | .01 U         | .05 U       | 025 U       | 1.2       | 005 U     | 01 U         |
| 47 SW107       | 06/16/89     | 2             | 2 UR          | .06 UV       | .01 UA      | 005 UR         | .005 UA      | 23.6 V       | 1 UV        | .01 UR        | .05 UV      | 025 UV      | 96 V      | 005 UA    | 1 UV         |
| 48 SW107       | 07/14/89     | 3             | 5.75 V        | .06 UV       | .0115 A     | 005 UV         | 005 UV       | 21.3 V       | 1 UV        | .01 UV        | .05 UV      | 025 UA      | 26.3 V    | 0116 A    | 1 UV         |
| 49 SW107       | 11/09/89     | 4             | .2 U          | .06 U        | 01 U        | .005 U         | 005 U        | 15.5         | 1 U         | .01 U         | .05 U       | 025 U       | 155       | 005 U     | 1 U          |

| Station Number | Date Sampled | Magnesium (Mg) | Manganese (Mn) | Mercury (Hg) | Molybdenum (Mo) | Nickel (Ni) | Potassium (K) | Selenium (Se) | Silver (Ag) | Sodium (Na) | Strontium (Sr) | Thallium (Tl) | Tin (Sn) | Vanadium (V) | Zinc (Zn) |
|----------------|--------------|----------------|----------------|--------------|-----------------|-------------|---------------|---------------|-------------|-------------|----------------|---------------|----------|--------------|-----------|
| 37 SW104       | 06/01/89     | 7.36 V         | .837 V         | .0002 UV     | 0203 A          | 04 UR       | 5 UA          | 005 UR        | 01 UV       | 15.3 V      | 1 UA           | .01 UA        | 1 UA     | 05 UA        | 0562 A    |
| 38 SW104       | 06/16/89     | 8.6 V          | .184 A         | .0002 A      | 1 UV            | 04 UR       | 6.5 A         | 005 UA        | .01 UA      | 8.92 V      | 1 UV           | .01 UA        | 1 UV     | 0935 V       | 221 V     |
| 39 SW104       | 07/14/89     | 9.8 V          | .14 V          | .0002 UV     | 1 UV            | .04 UR      | 5 UV          | 005 UA        | 01 UV       | 9.11 V      | 1 UV           | .01 UV        | 106 V    | 116 V        | 288 V     |
| 40 SW104       | 08/04/89     | 13.2 V         | .215 V         | .0002 UR     | .1 UV           | .04 UV      | 5.66 V        | 005 UA        | 01 UV       | 9.55 V      | 1 UV           | .01 UV        | 1 UV     | 164 V        | 259 V     |
| 41 SW104       | 09/19/89     | 5 U            | .015 U         | .0002 U      | 1 U             | 04 U        | 5 U           | 005 U         | 01 U        | 8.83        | 1 U            | .01 U         | 1 U      | 05 U         | 119       |
| 42 SW104       | 10/13/89     | 5 U            | .015 U         | .0002 U      | 1 U             | 04 U        | 5 U           | .005 U        | 01 U        | 7.39        | 1 U            | .01 U         | 1 U      | .05 U        | 02 U      |
| 43 SW104       | 11/20/89     | 5 U            | .015           | .0002 U      | 1 U             | 04 U        | 5 U           | 005 U         | .01 U       | 8.33        | 123            | .01 U         | 1 U      | 05 U         | 02 U      |
| 44 SW104       | 12/04/89     | 5 U            | .015 U         | .0002 U      | 1 U             | 04 U        | 5 U           | 005 U         | 01 U        | 7.84        | 151            | .01 U         | 1 U      | 05 U         | 02 U      |
| 45 SW107       | 02/27/89     | 5.78 V         | .0175 A        | .0004 A      | 1 UV            | 04 UA       | 5 UA          | 005 UA        | 01 UV       | 30.8 V      | .123 V         | .01 UR        | 1 UV     | .05 UV       | 02 UA     |
| 46 SW107       | 05/26/89     | 5 U            | .158           | .0002 U      | 0105            | 04 U        | 5 U           | 005 U         | 01 U        | 15.7        | 1 U            | .01 U         | 1 U      | 05 U         | 02 U      |
| 47 SW107       | 06/16/89     | 6.03 V         | .0726 A        | .0002 UV     | .1 UV           | 04 UR       | 5 UR          | .005 UA       | .01 UA      | 16.2 V      | 1 UV           | .01 UA        | 1 UV     | 05 UV        | 02 UA     |
| 48 SW107       | 07/14/89     | 5.13 V         | 4.06 V         | .0002 UV     | .1 UV           | 04 UR       | 5 UA          | 005 UR        | 01 UV       | 7.44 V      | 1 UV           | .01 UV        | 1 UV     | 05 UV        | 208 V     |
| 49 SW107       | 11/09/89     | 5 U            | .0201          | .0004        | .1 U            | 04 U        | 5 U           | 005 U         | .01 U       | 7.89        | 1 U            | .01 U         | 1 U      | 05 U         | 02 U      |

U=Analyzed but not detected J=Present below detection limit E=Estimated value =Missing  
A=Acceptable with qualifications V=Valid and acceptable R=Rejected Qtr=Quarter

Total Metal Concentrations for 1989 Background Surface Water Stations  
(Concentration units mg/l)

page 5

| Station Number | Date Sampled | Aluminum (Al) | Antimony (Sb) | Arsenic (As) | Barium (Ba) | Beryllium (Be) | Cadmium (Cd) | Calcium (Ca) | Cesium (Cs) | Chromium (Cr) | Cobalt (Co) | Copper (Cu) | Iron (Fe) | Lead (Pb) | Lithium (Li) |
|----------------|--------------|---------------|---------------|--------------|-------------|----------------|--------------|--------------|-------------|---------------|-------------|-------------|-----------|-----------|--------------|
| 50 SW107       | 12/04/89     | 2 U           | 06 U          | 01 U         | 2 U         | 005 U          | 005 U        | 13 5         | 2 5 U       | .01 U         | 05 U        | 025 U       | 264       | 003 U     | .1 U         |
| 51 SW108       | 03/02/89     | 2 UA          | .06 UR        | .01 UV       | 2 UV        | 005 UA         | .005 UR      | 67 A         | 1 UV        | 01 UR         | .05 UR      | 025 UV      | .396 V    | .005 UA   | 1 UV         |
| 52 SW108       | 05/30/89     | 4 98 V        | .06 UV        | 01 UV        | 2 UV        | .005 UA        | 005 UA       | 63 9 V       | 1 UV        | .01 UA        | 05 UV       | 025 UV      | 4 32 V    | 005 UA    | 0192 V       |
| 53 SW108       | 05/30/89     | 4 93 V        | 06 UV         | 01 UV        | 2 UV        | 005 UA         | 005 UA       | 63 V         | 1 UV        | 01 UA         | .05 UV      | 025 UV      | 4 19 V    | .0062 A   | 0183 V       |
| 54 SW108       | 06/15/89     | 2 1 12        | .06 U         | 01 U         | 2 U         | 005 U          | .005 U       | 62 8         | 1 U         | 01 U          | 05 U        | .025 U      | 1 55      | 005 U     | .1 U         |
| 55 SW108       | 07/13/89     | 3 22 3 V      | 06 UA         | 0348 V       | .55 V       | 005 UV         | 005 UV       | 93 8 V       | 1 UV        | 0164 A        | 05 UV       | .0461 V     | 37.3 V    | 0357 A    | 1 UA         |
| 56 SW108       | 12/05/89     | .2 U          | 06 U          | 01 U         | 2 U         | .005 U         | 005 U        | 226          | 2 5 U       | 01 U          | 05 U        | 025 U       | 1 U       | .003 U    | 1 U          |

| Station Number | Date Sampled | Magnesium (Mg) | Manganese (Mn) | Mercury (Hg) | Molybdenum (Mo) | Nickel (Ni) | Potassium (K) | Selenium (Se) | Silver (Ag) | Sodium (Na) | Strontium (Sr) | Thallium (Tl) | Tin (Sn) | Vanadium (V) | Zinc (Zn) |
|----------------|--------------|----------------|----------------|--------------|-----------------|-------------|---------------|---------------|-------------|-------------|----------------|---------------|----------|--------------|-----------|
| 50 SW107       | 12/04/89     | 5 U            | 0344           | .0002 U      | 1 U             | .04 U       | 5 U           | 005 U         | 01 U        | 7.63        | 1 U            | 01 U          | 1 U      | 05 U         | 0252      |
| 51 SW108       | 03/02/89     | 9 47 A         | 0534 A         | .0003 R      | 1 UV            | 04 UR       | 5 UA          | .005 UA       | 0106 A      | 12 5 V      | 285 V          | 005 UA        | .1 UV    | 05 UA        | 02 UV     |
| 52 SW108       | 05/30/89     | 12 3 V         | 218 V          | .0004 A      | 0176 A          | 04 UR       | 5 UA          | 005 UA        | 01 UV       | 21 5 V      | 1 UA           | 01 UA         | .1 UA    | 05 UA        | 02 UR     |
| 53 SW108       | 05/30/89     | 12.2 V         | .214 V         | 0012 A       | 0188 A          | 04 UR       | 5 UA          | 005 UA        | 01 UV       | 21 9 V      | 1 UA           | 01 UA         | .1 UA    | 05 UA        | 02 UR     |
| 54 SW108       | 06/15/89     | 11 6           | .329           | .0013        | .1 U            | 04 U        | 5 U           | 005 U         | 01 U        | 17.1        | 1 U            | 01 U          | .1 U     | .05 U        | 0923      |
| 55 SW108       | 07/13/89     | 15 3 V         | 786 V          | .0002 UR     | 1 UA            | 04 UA       | 7 14 V        | 005 UA        | .01 UA      | 33 7 V      | 1 UA           | .01 UV        | 1 UA     | .0726 V      | 239 V     |
| 56 SW108       | 12/05/89     | 28 5           | 0271           | .0002 U      | 1 U             | 04 U        | 5 U           | 0093          | 01 U        | 26 1        | 1 02           | 01 U          | 1 U      | .05 U        | 02 U      |

U=Analyzed but not detected J=Present below detection limit E=Estimated value =Missing  
A=Acceptable with qualifications V=Valid and acceptable R=Rejected qtr=Quarter

Dissolved Metal Concentrations for 1989 Background Surface Water Stations  
(Concentration units mg/L)

page 1

| Station Number | Date Sampled   | Aluminum (Al) | Antimony (Sb) | Arsenic (As) | Barium (Ba) | Beryllium (Be) | Cadmium (Cd) | Calcium (Ca) | Cesium (Cs) | Chromium (Cr) | Cobalt (Co) | Copper (Cu) | Iron (Fe) | Lead (Pb) | Lithium (Li) |
|----------------|----------------|---------------|---------------|--------------|-------------|----------------|--------------|--------------|-------------|---------------|-------------|-------------|-----------|-----------|--------------|
| 1              | SW004 03/02/89 | 2 UA          | 06 UR         | .01 UV       | 2 UV        | .005 UA        | .005 UR      | 34 V         | 1 UV        | .01 UR        | .05 UR      | 025 UV      | 1 UV      | .005 UA   | .1 UV        |
| 2              | SW004 06/15/89 | 2 U           | 06 U          | .01 U        | 2 U         | .005 U         | .005 U       | 32.2         | 1 U         | .01 U         | .05 U       | 025 U       | 1 U       | .005 U    | .1 U         |
| 3              | SW005 02/28/89 | .2 UV         | 06 UR         | .01 UA       | 2 UV        | .005 UA        | .005 UV      | 26.5 V       | 1 UV        | .01 UR        | .05 UV      | 025 UV      | 1 UV      | .01 UA    | .1 UV        |
| 4              | SW005 06/09/89 | 2 UA          | 06 UA         | .01 UV       | .2 UR       | .005 UA        | .005 UR      | 13.7 A       | 1 UV        | .01 UR        | .05 UR      | 025 UR      | 254 V     | .005 UA   | .1 UV        |
| 5              | SW005 07/13/89 | 2 UV          | .06 UA        | .01 UV       | 2 UV        | .005 UV        | .005 UV      | 22.9 V       | 1 UV        | .01 UV        | .05 UV      | 025 UA      | 1 UV      | .005 UA   | 1 UA         |
| 6              | SW005 08/01/89 | 2 UR          | 06 UV         | .01 UV       | .2 UV       | .005 UV        | .005 UV      | 22.8 V       | 1 UV        | .01 UV        | .05 UV      | 025 UA      | 1 UR      | .005 UA   | .1 UV        |
| 7              | SW005 09/05/89 | 2 U           | 06 U          | .01 U        | .2 U        | .005 U         | .005 U       | 21.4         | 1 U         | .01 U         | .05 U       | 025 U       | 1 U       | .005 U    | .1 U         |
| 8              | SW005 10/02/89 | 067 V         | 5 UV          | .002 UV      | .05 UV      | .002 UV        | .004 UV      | 21.2 V       | 1 UV        | .02 UV        | .02 UR      | 02 UV       | 0541 V    | .0037 A   | .007 V       |
| 9              | SW005 11/01/89 | 03 U          | 5 U           | .002 U       | .05 U       | .002 U         | .004 U       | 22.6         | 1 U         | .02 U         | .02 U       | 02 U        | 0539      | .002 U    | .008         |
| 10             | SW005 12/04/89 | 2 U           | 06 U          | .01 U        | .2 U        | .005 U         | .005 U       | 23.2         | 2.5 U       | .01 U         | .05 U       | 025 U       | 1 U       | .003 U    | 1 U          |
| 11             | SW006 02/24/89 | 485           | 06 U          | .01 U        | 2 U         | .005 U         | .005 U       | 25.5         | 1 U         | .01 U         | .05 U       | .025 U      | 1.78      | .005 U    | 1 U          |
| 12             | SW006 02/24/89 | 1             | 06 UR         | .01 UA       | .2 UV       | .005 UV        | .005 UV      | 23.9 V       | 1 UV        | .01 UR        | .05 UV      | 025 UV      | 901 V     | .005 UV   | 1 UV         |

| Station Number | Date Sampled   | Magnesium (Mg) | Manganese (Mn) | Mercury (Hg) | Molybdenum (Mo) | Nickel (Ni) | Potassium (K) | Selenium (Se) | Silver (Ag) | Sodium (Na) | Strontium (Sr) | Thallium (Tl) | Tin (Sn) | Vanadium (V) | Zinc (Zn) |
|----------------|----------------|----------------|----------------|--------------|-----------------|-------------|---------------|---------------|-------------|-------------|----------------|---------------|----------|--------------|-----------|
| 1              | SW004 03/02/89 | 7.65 A         | .015 UA        | .0005 R      | .1 UV           | .04 UR      | 5 UA          | .005 UA       | .01 UA      | 21.7 V      | 197 V          | .05 UA        | 1 UV     | .05 U        | .02 UV    |
| 2              | SW004 06/15/89 | 7.44           | .015 U         | .0002 U      | 1 U             | .04 U       | 5 U           | .005 U        | .01 U       | 24.1        | 1 U            | .04 U         | 1 U      | .05 U        | .02 U     |
| 3              | SW005 02/28/89 | 6.43 V         | .015 UR        | .0003 A      | 1 UV            | .04 UR      | 5 UA          | .005 UA       | .01 UV      | 17.1 V      | .161 V         | .01 UA        | 1 UV     | .05 U        | .02 UA    |
| 4              | SW005 06/09/89 | 5 UA           | .015 UV        | .0002 UV     | .1 UV           | .04 UA      | 5 UA          | .005 UA       | .01 UA      | 13.1 V      | 1 UV           | .01 UA        | 1 UV     | .05 U        | .02 UA    |
| 5              | SW005 07/13/89 | 5 UV           | .015 UV        | .0002 UV     | 1 UA            | .04 UA      | 5 UR          | .005 UR       | .01 UA      | 12.8 V      | 1 UA           | .01 UV        | 1 UA     | .05 U        | .02 UV    |
| 6              | SW005 08/01/89 | 5 UV           | .015 UV        | .0002 UV     | .1 UV           | .04 UV      | 5 UA          | .005 UA       | .01 UA      | 11.6 A      | 1 UV           | .01 UV        | 1 UV     | .05 U        | .02 UA    |
| 7              | SW005 09/05/89 | 5 U            | .015 U         | .0002 U      | 1 U             | .04 U       | 5 U           | .005 U        | .01 U       | 12.3        | 1 U            | .01 U         | 1 U      | .05 U        | .02 U     |
| 8              | SW005 10/02/89 | 4.34 V         | .01 UA         | .0002 UA     | 5 UV            | .02 UV      | 1.18 A        | .002 UV       | .03 UV      | 12 V        | 131            | .003 UV       | 1 UV     | .01 U        | .0236 A   |
| 9              | SW005 11/01/89 | 4.65           | .01 U          | .0002 U      | .5 U            | .02 U       | 1.97          | .002 U        | .03 U       | 12.4        | 138            | .003 U        | 1 U      | .01 U        | .01 U     |
| 10             | SW005 12/04/89 | 5.03           | .015 U         | .0002 U      | 1 U             | .04 U       | 5 U           | .005 U        | .01 U       | 14          | .159           | .01 U         | 1 U      | .05 U        | .02 U     |
| 11             | SW006 02/24/89 | 7.73           | 368            | .0002 U      | .1 U            | .04 U       | 5 U           | .005 U        | .01 U       | 29.3        | 173            | .01 U         | 1 U      | .05 U        | .0242     |
| 12             | SW006 02/24/89 | 7.49 V         | .338 V         | .0002 UR     | .1 UV           | .04 UR      | 5 UA          | .005 UV       | .01 UV      | 27 V        | 163 V          | .01 UV        | 1 UV     | .05 U        | .02 UA    |

U=Analyzed but not detected J=Present below detection limit E=Estimated value =Missing  
A=Acceptable with qualifications V=Valid and acceptable R=Rejected Qtr=Quarter

Dissolved Metal Concentrations for 1989 Background Surface Water Stations  
(Concentration units mg/l)

page 2

| Station Number | Date Sampled | Aluminum (Al) | Antimony (Sb) | Arsenic (As) | Barium (Ba) | Beryllium (Be) | Cadmium (Cd) | Calcium (Ca) | Cesium (Cs) | Chromium (Cr) | Cobalt (Co) | Copper (Cu) | Iron (Fe) | Lead (Pb) | Lithium (Li) |
|----------------|--------------|---------------|---------------|--------------|-------------|----------------|--------------|--------------|-------------|---------------|-------------|-------------|-----------|-----------|--------------|
| =====          | =====        | =====         | =====         | =====        | =====       | =====          | =====        | =====        | =====       | =====         | =====       | =====       | =====     | =====     | =====        |
| 13 SW006       | 05/31/89     | 2             | .454 A        | .06 UV       | .01 UV      | .005 UA        | .005 UA      | 14.5 V       | 1 UV        | .01 UA        | .05 UV      | .025 UV     | .371 V    | .0131 V   | .01 UV       |
| 14 SW006       | 06/08/89     | 2             | .29 A         | .06 UV       | .01 UR      | .005 UA        | .005 UV      | 20 V         | 1 UV        | .01 UV        | .05 UV      | .0257 A     | .49 V     | .005 UR   | 1 UA         |
| 15 SW006       | 07/13/89     | 3             | 2 UV          | .06 UA       | .01 UV      | .005 UV        | .005 UV      | 18 V         | 1 UV        | .01 UV        | .05 UV      | .025 UA     | .332 V    | .005 UA   | 1 UA         |
| 16 SW006       | 08/01/89     | 3             | 2 UR          | .06 UV       | .01 UV      | .005 UV        | .005 UV      | 18.6 V       | 1 UV        | .01 UV        | .05 UV      | .025 UA     | .272 A    | .005 UA   | 1 UV         |
| 17 SW006       | 09/05/89     | 3             | 2 U           | .06 U        | .01 U       | .005 U         | .005 U       | 14.9         | 1 U         | .01 U         | .05 U       | .025 U      | 1 U       | .005 U    | 1 U          |
| 18 SW006       | 10/02/89     | 4             | .0527 V       | .5 UV        | .002 UV     | .002 UR        | .004 UR      | 10.7 V       | 1 UV        | .02 UV        | .02 UR      | .02 UV      | .276 V    | .0024 A   | .002 V       |
| 19 SW006       | 11/01/89     | 4             | .0338         | 5 U          | .002 U      | .002 U         | .004 U       | 11.7         | 1 U         | .02 U         | .02 U       | .02 U       | .261      | .002      | .003         |
| 20 SW006       | 12/04/89     | 4             | 2 U           | .06 U        | .01 U       | .005 U         | .005 U       | 12.4         | 2.5 U       | .01 U         | .05 U       | .025 U      | .155      | .003 U    | .1 U         |
| 21 SW006       | 12/04/89     | 4             | 2 U           | .06 U        | .01 U       | .005 U         | .005 U       | 13.2         | 2.5 U       | .01 U         | .05 U       | .025 U      | .178      | .003 U    | .102         |
| 22 SW007       | 02/27/89     | 1             | 2 U           | .06 U        | .01 U       | .005 U         | .005 U       | 15.3         | 1 U         | .01 U         | .05 U       | .025 U      | 1 U       | .005 U    | .1 U         |
| 23 SW007       | 05/31/89     | 2             | 2 UV          | .06 UV       | .01 UV      | .005 UV        | .005 UA      | 23.6 V       | 1 UV        | .01 UA        | .05 UV      | .025 UV     | 1 UA      | .005 UA   | .01 UV       |
| 24 SW007       | 06/08/89     | 2             | 2 UA          | .06 UV       | .01 UR      | .005 UA        | .005 UV      | 24.9 V       | 1 UV        | .01 UV        | .05 UV      | .025 UA     | 1 UA      | .005 UR   | 1 UA         |
| 25 SW007       | 08/01/89     | 3             | 2 UV          | .06 UV       | .01 UR      | .005 UV        | .005 UV      | 19 V         | 1 UV        | .01 UR        | .05 UV      | .025 UR     | 1 UV      | .005 UA   | 1 UV         |

| Station Number | Date Sampled | Magnesium (Mg) | Manganese (Mn) | Mercury (Hg) | Molybdenum (Mo) | Nickel (Ni) | Potassium (K) | Selenium (Se) | Silver (Ag) | Sodium (Na) | Strontium (Sr) | Thallium (Tl) | Tin (Sn) | Vanadium (V) | Zinc (Zn) |
|----------------|--------------|----------------|----------------|--------------|-----------------|-------------|---------------|---------------|-------------|-------------|----------------|---------------|----------|--------------|-----------|
| =====          | =====        | =====          | =====          | =====        | =====           | =====       | =====         | =====         | =====       | =====       | =====          | =====         | =====    | =====        | =====     |
| 13 SW006       | 05/31/89     | 5 UV           | .029 V         | .0002 UV     | .0176 A         | .04 UA      | 5 UA          | .005 UR       | .01 UV      | 21.4 V      | 1 UA           | .01 UA        | 1 UA     | .05 U        | .0228 A   |
| 14 SW006       | 06/08/89     | 5 UV           | .041 V         | .0002 UV     | .1 UV           | .04 UV      | 5 UR          | .005 UA       | .01 UV      | 19.9 V      | 128 A          | .01 UV        | .1 UV    | .05 U        | .0422 A   |
| 15 SW006       | 07/13/89     | 5 UV           | .0458 V        | .0002 UR     | .1 UA           | .04 UA      | 5 UR          | .005 UA       | .01 UA      | 23.1 V      | 1 UA           | .01 UV        | .1 UA    | .05 U        | .02 UV    |
| 16 SW006       | 08/01/89     | 5 UV           | .0416 V        | .0002 UV     | .1 UA           | .04 UV      | 5 UA          | .005 UA       | .01 UA      | 23.5 A      | 1 UV           | .01 UV        | 1 UV     | .05 U        | .02 UV    |
| 17 SW006       | 09/05/89     | 5 3            | .015 U         | .0002 U      | .1 U            | .04 U       | 5 U           | .005 U        | .01 U       | 24          | 1 U            | .01 U         | 1 U      | .05 U        | .02 U     |
| 18 SW006       | 10/02/89     | 3 03 V         | .0113 V        | .0002 UA     | .5 UV           | .02 UV      | 2.6 V         | .002 UV       | .03 UV      | 14.6 V      | .0737          | .003 UV       | 1 UV     | .01 U        | .0129 A   |
| 19 SW006       | 11/01/89     | 3 56           | .0105          | .0002 U      | .5 U            | .02 U       | 2.46          | .002 U        | .03 U       | 16.2        | .0806          | .003 U        | 1 U      | .01 U        | .0153     |
| 20 SW006       | 12/04/89     | 5 U            | .015 U         | .0002 U      | .1 U            | .04 U       | 5 U           | .005 U        | .01 U       | 17          | 1 U            | .01 U         | 1 U      | .05 U        | .02 U     |
| 21 SW006       | 12/04/89     | 5 U            | .015 U         | .0002 U      | .1 U            | .04 U       | 5 U           | .005 U        | .01 U       | 18.2        | 101            | .01 U         | .1 U     | .05 U        | .0382     |
| 22 SW007       | 02/27/89     | 5 U            | .015 U         | .0003        | .1 U            | .04 U       | 5 U           | .005 U        | .01 U       | 17.7        | 1 U            | .01 U         | 1 U      | .05 U        | .032      |
| 23 SW007       | 05/31/89     | 6 09 V         | .0768 V        | .0002 UV     | .0119 A         | .04 UA      | 5 UA          | .005 UR       | .01 UV      | 33.8 V      | 1 UA           | .05 UA        | 1 UA     | .05 U        | .02 UR    |
| 24 SW007       | 06/08/89     | 6 01 V         | .015 UV        | .0002 UV     | .1 UV           | .04 UV      | 5 UR          | .005 UA       | .01 UV      | 29.3 V      | .156 A         | .01 UV        | 1 UV     | .05 U        | .102 V    |
| 25 SW007       | 08/01/89     | 5 UV           | .0682 V        | .0002 UR     | .1 UV           | .04 UV      | 5 UV          | .005 UA       | .01 UV      | 22.4 V      | 1 UV           | .01 UV        | 1 UV     | .05 U        | .0299 V   |

U=Analyzed but not detected J=Present below detection limit E=Estimated value =Missing  
A=Acceptable with qualifications V=Valid and acceptable R=Rejected Qtr=Quarter

Dissolved Metal Concentrations for 1989 Background Surface Water Stations  
(Concentration units mg/l)

page 3

| Station Number | Date Sampled   | Aluminum (Al) | Antimony (Sb) | Arsenic (As) | Barium (Ba) | Beryllium (Be) | Cadmium (Cd) | Calcium (Ca) | Cesium (Cs) | Chromium (Cr) | Cobalt (Co) | Copper (Cu) | Iron (Fe) | Lead (Pb) | Lithium (Li) |
|----------------|----------------|---------------|---------------|--------------|-------------|----------------|--------------|--------------|-------------|---------------|-------------|-------------|-----------|-----------|--------------|
| 26             | SW041 03/01/89 | 2 UR          | 06 UR         | .01 UV       | 2 UV        | 005 UA         | 005 UV       | 20.4 V       | 1 UV        | 01 UR         | 05 UV       | 025 UV      | 1 UV      | .005 UA   | 1 UV         |
| 27             | SW041 05/26/89 | 2 U           | 06 U          | 01 U         | 2 U         | 005 U          | 005 U        | 34.8         | 1 U         | 01 U          | 05 U        | 025 U       | 1 U       | 005 U     | .01 U        |
| 28             | SW041 06/16/89 | .2 UR         | 06 UV         | 01 UA        | 2 UV        | .005 UR        | 005 UA       | 28.9 V       | 1 UV        | 01 UR         | 05 UV       | 025 UV      | 1 UA      | 005 UA    | 1 UV         |
| 29             | SW041 11/20/89 | 2 U           | .06 U         | 01 U         | .2 U        | .005 U         | 005 U        | 26.8         | 2.5 U       | .01 U         | 05 U        | 025 U       | 1 U       | 003 U     | 1 U          |
| 30             | SW041 12/05/89 | 2 U           | 06 U          | 01 U         | 2 U         | .005 U         | 005 U        | 28.3         | 2.5 U       | .01 U         | 05 U        | 025 U       | 1 U       | 006 U     | 1 U          |
| 31             | SW080 03/01/89 | 2 UA          | 06 UR         | .01 UV       | 2 UV        | 005 UA         | 005 UV       | 31.5 V       | 1 UV        | 01 UR         | 05 UV       | 025 UV      | 2.03 A    | 005 UA    | 1 UV         |
| 32             | SW080 06/16/89 | 2 UR          | .06 UV        | .01 UA       | 211 V       | 005 UR         | 005 UA       | 41.7 V       | 1 UV        | .01 UA        | 05 UV       | 025 UV      | 16.7 V    | 005 UA    | 1 UV         |
| 33             | SW080 07/14/89 | 2 A           | .06 UV        | .01 UA       | 2 UV        | 005 UV         | 005 UV       | 58.3 V       | 1 UV        | .01 UV        | 05 UV       | 025 UV      | 3.54 V    | 005 UA    | 1 UV         |
| 34             | SW080 10/13/89 | .2 U          | .06 U         | .01 U        | 2 U         | 005 U          | 005 U        | 34.4         | 1 U         | .01 U         | 05 U        | 025 U       | 1.33      | 005 U     | 1 U          |
| 35             | SW080 11/20/89 | 2 U           | 06 U          | .01 U        | 2 U         | .005 U         | 005 U        | 27.8         | 2.5 U       | 01 U          | 05 U        | 025 U       | 1.35      | 0054      | 1 U          |
| 36             | SW080 12/05/89 | 2 U           | .06 U         | .01 U        | 2 U         | 005 U          | .005 U       | 34.2         | 2.5 U       | 01 U          | 05 U        | 025 U       | 1.81      | 003 U     | 1 U          |
| 37             | SW104 03/02/89 | 2 UR          | .06 UA        | .01 UA       | .2 UV       | 005 UR         | 005 UR       | 78.4 A       | 1 UV        | 01 UR         | 05 UR       | 025 UV      | 4.69 UV   | .005 UA   | 1 UV         |

| Station Number | Date Sampled   | Magnesium (Mg) | Manganese (Mn) | Mercury (Hg) | Molybdenum (Mo) | Nickel (Ni) | Potassium (K) | Selenium (Se) | Silver (Ag) | Sodium (Na) | Strontium (Sr) | Thallium (Tl) | Tin (Sn) | Vanadium (V) | Zinc (Zn) |
|----------------|----------------|----------------|----------------|--------------|-----------------|-------------|---------------|---------------|-------------|-------------|----------------|---------------|----------|--------------|-----------|
| 26             | SW041 03/01/89 | 5.82 V         | .0396 A        | .0002 UA     | 1 UV            | 04 UV       | 5 UA          | .005 UA       | 01 UV       | 29.4 V      | 124 V          | 04 UA         | 1 UV     | .05 U        | 02 UA     |
| 27             | SW041 05/26/89 | 9.04           | 0566           | 0004         | 0105            | 04 U        | 5 U           | .005 U        | 01 U        | 26.1        | 1 U            | 05 U          | 1 U      | .05 U        | 02 U      |
| 28             | SW041 06/16/89 | 7.5 V          | .0726 A        | 0002 UV      | .1 UV           | 04 UR       | 5 UR          | .005 UA       | 01 UA       | 20.9 V      | 1 UV           | 04 UA         | 1 UV     | .05 U        | 02 UR     |
| 29             | SW041 11/20/89 | 7.9            | .015 U         | .0002 U      | .1 U            | 04 U        | 5 U           | .005 U        | 01 U        | 28.3        | 176            | 01 U          | 1 U      | 05 U         | .02 U     |
| 30             | SW041 12/05/89 | 7.79           | .015 U         | 0002 U       | 1 U             | .04 U       | 5 U           | .005 U        | 01 U        | 26.1        | 195            | 01 U          | 1 U      | .05 U        | 0757      |
| 31             | SW080 03/01/89 | 5 UV           | .15 A          | .0013 A      | 1 UV            | 04 UV       | 5 UA          | .005 UA       | 01 UV       | 8.38 V      | 138 V          | 04 UA         | .1 UV    | 05 U         | 02 UV     |
| 32             | SW080 06/16/89 | 5.18 V         | .639 A         | 0002 UV      | 1 UV            | 04 UR       | 5 UV          | .005 UV       | .01 UA      | 9.13 V      | 1 UV           | 04 UA         | .1 UV    | .05 U        | 02 UR     |
| 33             | SW080 07/14/89 | 7.87 V         | .191 V         | 0002 UR      | 1 UV            | 04 UR       | 5 UV          | .005 UA       | 01 UV       | 12 V        | 1 UV           | .01 UV        | 1 UV     | .05 U        | 02 UA     |
| 34             | SW080 10/13/89 | 5 U            | 185            | 0002 U       | 1 U             | 04 U        | 5 U           | .005 U        | 01 U        | 9.9         | 1 U            | 01 U          | 1 U      | 05 U         | 02 U      |
| 35             | SW080 11/20/89 | 5 U            | 3              | 0002 U       | 1 U             | 04 U        | 5 U           | .005 U        | .01 U       | 9.68        | 148            | 01 U          | 1 U      | 05 U         | 02 U      |
| 36             | SW080 12/05/89 | 5 U            | 76             | .0002 U      | 1 U             | .04 U       | 5 U           | .005 U        | .01 U       | 8.65        | 186            | 01 U          | 1 U      | 05 U         | 02 U      |
| 37             | SW104 03/02/89 | 6.83 A         | 48 A           | 0003 R       | 1 UV            | 04 UR       | 5 UA          | .005 UA       | 0125 A      | 11.2 V      | 206 V          | .05 UA        | .1 UV    | 05 U         | 02 UV     |

U=Analyzed but not detected J=Present below detection limit E=Estimated value =Missing  
A=Acceptable with qualifications V=Valid and acceptable R=Rejected Qtr=Quarter

Dissolved Metal Concentrations for 1989 Background Surface Water Stations  
(Concentration units mg/l)

page 4

| Station Number | Date Sampled | Aluminum (Al) | Antimony (Sb) | Arsenic (As) | Barium (Ba) | Beryllium (Be) | Cadmium (Cd) | Calcium (Ca) | Cesium (Cs) | Chromium (Cr) | Cobalt (Co) | Copper (Cu) | Iron (Fe) | Lead (Pb) | Lithium (Li) |
|----------------|--------------|---------------|---------------|--------------|-------------|----------------|--------------|--------------|-------------|---------------|-------------|-------------|-----------|-----------|--------------|
| 38 SW104       | 06/01/89     | 2 U           | .06 U         | .01 U        | .2 U        | .005 U         | .005 U       | 55.3 V       | 1 U         | .01 U         | .05 U       | .025 U      | .116 A    | .005 U    | .01 U        |
| 39 SW104       | 06/16/89     | 2 U           | .06 U         | .01 U        | .2 U        | .005 U         | .005 U       | 37.5 V       | 1 U         | .01 U         | .05 U       | .025 U      | .137 A    | .005 U    | .01 U        |
| 40 SW104       | 07/14/89     | 3             | .06 U         | .01 U        | .2 U        | .005 U         | .005 U       | 37.8 V       | 1 U         | .01 U         | .05 U       | .025 U      | .649 V    | .005 U    | .01 U        |
| 41 SW104       | 08/04/89     | 3             | .06 U         | .01 U        | .2 U        | .005 U         | .005 U       | 37.1 V       | 1 U         | .01 U         | .05 U       | .025 U      | .196 V    | .005 U    | .01 U        |
| 42 SW104       | 09/19/89     | 3             | .06 U         | .01 U        | .2 U        | .005 U         | .005 U       | 38.5         | 1 U         | .01 U         | .05 U       | .025 U      | .1 U      | .005 U    | .01 U        |
| 43 SW104       | 10/13/89     | 4             | .06 U         | .01 U        | .2 U        | .005 U         | .005 U       | 40           | 1 U         | .01 U         | .05 U       | .025 U      | .1 U      | .005 U    | .01 U        |
| 44 SW104       | 11/20/89     | 4             | .06 U         | .01 U        | .2 U        | .005 U         | .005 U       | 35.5         | 2.5 U       | .01 U         | .05 U       | .025 U      | .1 U      | .003 U    | .01 U        |
| 45 SW104       | 11/20/89     | 4             | .06 U         | .01 U        | .2 U        | .005 U         | .005 U       | 35.5         | 2.5 U       | .01 U         | .05 U       | .025 U      | .1 U      | .003 U    | .01 U        |
| 46 SW104       | 12/04/89     | 4             | .06 U         | .01 U        | .2 U        | .005 U         | .005 U       | 37           | 2.5 U       | .01 U         | .05 U       | .025 U      | .1 U      | .003 U    | .01 U        |
| 47 SW107       | 02/27/89     | 1             | .06 U         | .01 U        | .2 U        | .005 U         | .005 U       | 20.3 V       | 1 U         | .01 U         | .05 U       | .025 U      | .1 U      | .0055 A   | .01 U        |
| 48 SW107       | 05/26/89     | 2             | .06 U         | .01 U        | .2 U        | .005 U         | .005 U       | 21.4         | 1 U         | .01 U         | .05 U       | .025 U      | .453      | .005 U    | .01 U        |
| 49 SW107       | 06/16/89     | 2             | .06 U         | .01 U        | .2 U        | .005 U         | .005 U       | 23.4 V       | 1 U         | .01 U         | .05 U       | .025 U      | .51 V     | .005 U    | .01 U        |
| 50 SW107       | 07/14/89     | 3             | .06 U         | .01 U        | .2 U        | .005 U         | .005 U       | 16.5 V       | 1 U         | .01 U         | .05 U       | .025 U      | .48 V     | .005 U    | .01 U        |

| Station Number | Date Sampled | Magnesium (Mg) | Manganese (Mn) | Mercury (Hg) | Molybdenum (Mo) | Nickel (Ni) | Potassium (K) | Selenium (Se) | Silver (Ag) | Sodium (Na) | Strontium (Sr) | Thallium (Tl) | Tin (Sn) | Vanadium (V) | Zinc (Zn) |
|----------------|--------------|----------------|----------------|--------------|-----------------|-------------|---------------|---------------|-------------|-------------|----------------|---------------|----------|--------------|-----------|
| 38 SW104       | 06/01/89     | 6.3 V          | .0404 V        | .0002 U      | .0154 A         | .04 U       | 5 U           | .005 U        | .01 U       | 14.1 V      | 1 U            | .05 U         | 1 U      | .05 U        | .02 U     |
| 39 SW104       | 06/16/89     | 5 U            | .015 U         | .0002 U      | .1 U            | .04 U       | 5 U           | .005 U        | .01 U       | 7.85 V      | 1 U            | .04 U         | 1 U      | .05 U        | .02 U     |
| 40 SW104       | 07/14/89     | 5 U            | .0195 V        | .0002 U      | .1 U            | .04 U       | 5 U           | .005 U        | .01 U       | 7.9 V       | 1 U            | .01 U         | 1 U      | .05 U        | .02 U     |
| 41 SW104       | 08/04/89     | 5 U            | .0211 A        | .0002 U      | .1 U            | .04 U       | 5 U           | .005 U        | .01 U       | 7.6 V       | 1 U            | .01 U         | .1 U     | .05 U        | .0256 A   |
| 42 SW104       | 09/19/89     | 5 U            | .015 U         | .0002 U      | .1 U            | .04 U       | 5 U           | .005 U        | .01 U       | 7.81        | 1 U            | .01 U         | 1 U      | .05 U        | .0721     |
| 43 SW104       | 10/13/89     | 5 U            | .015 U         | .0002 U      | .1 U            | .04 U       | 5 U           | .005 U        | .01 U       | 8.12        | 1 U            | .01 U         | 1 U      | .05 U        | .02 U     |
| 44 SW104       | 11/20/89     | 5 U            | .015 U         | .0002 U      | .1 U            | .04 U       | 5 U           | .005 U        | .01 U       | 8.87        | .13            | .01 U         | 1 U      | .05 U        | .037      |
| 45 SW104       | 11/20/89     | 5 U            | .015 U         | .0002 U      | .1 U            | .04 U       | 5 U           | .005 U        | .01 U       | 8.57        | 128            | .01 U         | 1 U      | .05 U        | .02 U     |
| 46 SW104       | 12/04/89     | 5 U            | .015 U         | .0002 U      | .1 U            | .04 U       | 5 U           | .005 U        | .01 U       | 8.01        | .145           | .01 U         | 1 U      | .05 U        | .02 U     |
| 47 SW107       | 02/27/89     | 5.92 V         | .015 U         | .0003 A      | .1 U            | .04 U       | 5 U           | .005 U        | .01 U       | 32.3 V      | 129 V          | .01 U         | 1 U      | .05 U        | .02 U     |
| 48 SW107       | 05/26/89     | 5.4            | .0364          | .0004        | .0178           | .04 U       | 5 U           | .005 U        | .01 U       | 15.6        | 1 U            | .05 U         | 1 U      | .05 U        | .02 U     |
| 49 SW107       | 06/16/89     | 6.02 V         | .0524 A        | .0002 U      | .1 U            | .04 U       | 5 U           | .0086 V       | .01 U       | 16.5 V      | 1 U            | .04 U         | 1 U      | .05 U        | .02 U     |
| 50 SW107       | 07/14/89     | 5 U            | 1.1 V          | .0002 U      | .1 U            | .04 U       | 5 U           | .005 U        | .01 U       | 6.56 V      | 1 U            | .01 U         | .1 U     | .05 U        | .02 U     |

U=Analyzed but not detected J=Present below detection limit E=Estimated value =Missing  
A=Acceptable with qualifications V=Valid and acceptable R=Rejected Qtr=Quarter

Dissolved Metal Concentrations for 1989 Background Surface Water Stations  
(Concentration units mg/l)

page 5

| Station Number | Date Sampled | Aluminum (Al) | Antimony (Sb) | Arsenic (As) | Barium (Ba) | Beryllium (Be) | Cadmium (Cd) | Calcium (Ca) | Cesium (Cs) | Chromium (Cr) | Cobalt (Co) | Copper (Cu) | Iron (Fe) | Lead (Pb) | Lithium (Li) |
|----------------|--------------|---------------|---------------|--------------|-------------|----------------|--------------|--------------|-------------|---------------|-------------|-------------|-----------|-----------|--------------|
| 51 SW107       | 11/09/89     | 2 U           | 06 U          | .01 U        | .2 U        | 005 U          | 005 U        | 14 9         | 1 U         | 01 U          | 05 U        | 025 U       | 1 U       | 005 U     | 1 U          |
| 52 SW107       | 12/04/89     | 2 U           | 06 U          | .01 U        | 2 U         | 005 U          | 005 U        | 12 7         | 2.5 U       | 01 U          | 05 U        | .025 U      | 155       | 003 U     | 1 U          |
| 53 SW108       | 03/02/89     | 2 UR          | .06 UR        | .01 UV       | .2 UV       | 005 UR         | 005 UR       | 68 A         | 1 UR        | 01 UR         | 05 UR       | .025 UV     | 1 UV      | 005 UA    | 1 UV         |
| 54 SW108       | 05/30/89     | .2 UV         | .06 UV        | .01 UV       | 2 UV        | 005 UA         | 005 UA       | 63 9 V       | 1 UV        | 01 UA         | 05 UV       | .025 UV     | 1 UA      | 005 UV    | 0166 V       |
| 55 SW108       | 05/30/89     | 2 UV          | .06 UV        | .01 UV       | .2 UV       | 005 UA         | 005 UA       | 64 V         | 1 UV        | 01 UA         | 05 UV       | 025 UV      | 1 UA      | 005 UR    | .0165 V      |
| 56 SW108       | 06/15/89     | .2 U          | .06 U         | .01 U        | .2 U        | 005 U          | 005 U        | 60 6         | 1 U         | 01 U          | 05 U        | 025 U       | 1 U       | 005 U     | .1 U         |
| 57 SW108       | 07/13/89     | 2 UV          | 06 UA         | .018 V       | .2 UV       | 005 UV         | 005 UV       | 21 2 V       | 1 UV        | 01 UV         | 05 UV       | 0278 A      | 1 UV      | 005 UA    | 1 UA         |
| 58 SW108       | 12/05/89     | 2 U           | 06 U          | 01 U         | .2 U        | 005 U          | 005 U        | 216          | 2 5 U       | 01 U          | 05 U        | 025 U       | 1 U       | 003 U     | .1 U         |

| Station Number | Date Sampled | Magnesium (Mg) | Manganese (Mn) | Mercury (Hg) | Molybdenum (Mo) | Nickel (Ni) | Potassium (K) | Selenium (Se) | Silver (Ag) | Sodium (Na) | Strontium (Sr) | Thallium (Tl) | Tin (Sn) | Vanadium (V) | Zinc (Zn) |
|----------------|--------------|----------------|----------------|--------------|-----------------|-------------|---------------|---------------|-------------|-------------|----------------|---------------|----------|--------------|-----------|
| 51 SW107       | 11/09/89     | 5 U            | 015 U          | 0002 U       | .1 U            | .04 U       | 5 U           | .005 U        | 01 U        | 8 04        | 1 U            | .01 U         | 1 U      | 05 U         | 02 U      |
| 52 SW107       | 12/04/89     | 5 U            | 015 U          | 0002 U       | .1 U            | .04 U       | 5 U           | 005 U         | 01 U        | 7 28        | 1 U            | 01 U          | 1 U      | 05 U         | .02 U     |
| 53 SW108       | 03/02/89     | 10 A           | 0506 A         | 0006 R       | .1 UV           | .04 UR      | 5 UA          | .005 UA       | 01 UA       | 13 2 V      | 296 V          | 05 UA         | .1 UV    | 05 U         | 02 UA     |
| 54 SW108       | 05/30/89     | 11.8 V         | .163 V         | 0002 UV      | .01 UR          | .04 UA      | 5 UA          | 005 UR        | .01 UV      | 20 1 V      | 1 UA           | 05 UA         | 1 UA     | 05 U         | 02 UR     |
| 55 SW108       | 05/30/89     | 11 8 V         | 162 V          | 0005 A       | .01 UR          | .04 UA      | 5 UA          | 005 UR        | .01 UV      | 20 V        | 1 UA           | 01 UA         | 1 UA     | 05 U         | .02 UA    |
| 56 SW108       | 06/15/89     | 11.3           | 0627           | 0002 U       | 1 U             | .04 U       | 5 U           | 005 U         | 01 U        | 16          | 1 U            | 04 U          | .1 U     | 05 U         | .02 U     |
| 57 SW108       | 07/13/89     | 5 UV           | 015 UV         | 0002 UR      | 1 UA            | 04 UA       | 5 UA          | 005 UR        | .01 UA      | 35.2 V      | 1 UA           | 01 UV         | 1 UA     | .05 U        | .02 UV    |
| 58 SW108       | 12/05/89     | 27 4           | 0298           | 0002 U       | 1 U             | 04 U        | 5 U           | 0124          | .01 U       | 24 6        | .967           | 01 U          | 1 U      | .05 U        | 0236      |

U=Analyzed but not detected J=Present below detection limit E=Estimated value Missing  
A=Acceptable with qualifications V=Valid and acceptable R=Rejected Qtr=Quarter

Inorganic Concentrations for 1989 Background Surface Water Stations  
(Concentration units mg/L except pH )

page 1

| Station Number | Date Sampled | Qtr | Total Dissolved Solids, TDS | Chloride Cl | Nitrate/Nitrite as N | Sulfate SO4 | Bicarbonate HCO3 | Carbonate CO3 | pH unit | Cyanide CN | Total Suspended Solids, TSS |
|----------------|--------------|-----|-----------------------------|-------------|----------------------|-------------|------------------|---------------|---------|------------|-----------------------------|
| SH004          | 03/02/89     | 1   | 180 A                       | 7 A         | 0 12 V               | 34 A        | 150 V            | 5 UV          | 8 1     | 0 01 U     | 5 UA                        |
| SH004          | 06/15/89     | 2   | 220 A                       | 5 V         | 0 05 UV              | 30 V        | 180 V            | 5 UV          | 8 3     | 0 0025 U   | 27 A                        |
| SH005          | 02/28/89     | 1   | 130 A                       | 6 A         | 0 91 A               | 29 A        | 110 V            | 5 UV          | 7 8     | 0 0025 UR  |                             |
| SH005          | 05/30/89     | 2   | 140 V                       | 4 V         | 0 4 V                | 23 V        | 94 V             | 5 UV          | 7 4     | 0 0025 UV  | 6 A                         |
| SH005          | 06/09/89     | 2   | 120 V                       | 4 V         | 0 08 V               | 21 V        | 66 V             | 5 UV          | 7 4     | 0 0025 U   | 5 UA                        |
| SH005          | 07/13/89     | 3   | 150 V                       | 3 UV        | 0 75 V               | 17 V        | 110 V            | 5 UV          | 7 4     | 0 01 UV    | 16 V                        |
| SH005          | 08/01/89     | 3   | 140 V                       | 3 V         | 0 83 V               | 16 V        | 110 V            | 5 UV          | 7 6     | 0 01 U     | 5 UV                        |
| SH005          | 09/05/89     | 3   | 150 A                       | 3 UA        | 1 1 V                | 13 A        | 120 V            | 5 UV          | 8 6     | 0 01 U     | 6 A                         |
| SH005          | 10/02/89     | 4   | 150 A                       | 3 UV        | 0 95 V               | 15 A        | 100 V            | 5 UV          | 7 6     | 0 0025 U   | 11 A                        |
| SH005          | 11/01/89     | 4   | 140 A                       | 4 V         | 1 4 V                | 17 V        | 110 A            | 5 UA          | 7 5     | 0 01 U     | 5 UA                        |
| SH005          | 12/04/89     | 4   |                             |             |                      |             |                  |               |         |            |                             |
| SH006          | 02/24/89     | 1   | 200 A                       | 15 V        | 0 64 A               | 5 A         | 120 V            | 5 UV          | 7 2     | 0 0025 UV  | 18 A                        |
| SH006          | 02/24/89     | 1   | 200                         | 14          | 0 25                 | 23          | 120              | 5 U           | 7 3     | 0 0025 U   | 18                          |
| SH006          | 05/31/89     | 2   | 140 V                       | 20 A        | 0 16 A               | 36 A        | 56 V             | 5 UV          | 7 2     | 0 0025 UV  | 26 V                        |
| SH006          | 06/08/89     | 2   | 150 V                       | 16 V        | 0 05 UV              | 29 A        | 86 V             | 5 UV          | 7 6     | 0 0025 U   | 36 A                        |
| SH006          | 07/13/89     | 3   | 170 V                       | 14 V        | 0 05 UV              | 26 V        | 100 V            | 5 UV          | 7 3     | 0 01 UV    | 15 V                        |
| SH006          | 08/01/89     | 3   | 150 V                       | 13 V        | 0 05 UV              | 26 V        | 110 V            | 5 UV          | 7 5     | 0 0404     | 100 V                       |
| SH006          | 08/01/89     | 3   | 150 V                       | 14 V        | 0 05 UV              | 27 V        | 100 V            | 5 UV          | 7 4     | 0 01 U     | 100 V                       |
| SH006          | 09/05/89     | 3   | 170 A                       | 11 A        | 0 05 V               | 66 A        | 55 V             | 5 UV          | 6 9     | 0 01 U     | 12 A                        |
| SH006          | 09/05/89     | 3   | 180 A                       | 11 V        | 0 05 UV              | 19 A        | 100 V            | 5 UV          | 7 5     | 0 01 U     | 12 A                        |
| SH006          | 10/02/89     | 4   | 120 A                       | 12 V        | 0 3 V                | 24 A        | 84 V             | 5 UV          | 7 1     |            | 5 UA                        |
| SH006          | 10/02/89     | 4   | 110 A                       | 12 V        | 0 05 UV              | 21 A        | 54 V             | 5 UV          | 7 2     |            | 9 A                         |
| SH006          | 11/01/89     | 4   | 100 A                       | 11 V        | 0 05 UV              | 23 V        | 62 A             | 5 UA          | 7 2     | 0 0025 U   | 10 A                        |
| SH006          | 12/04/89     | 4   |                             |             |                      |             |                  |               |         | 0 01 U     |                             |
| SH006          | 12/04/89     | 4   |                             |             |                      |             |                  |               |         | 0 01 U     |                             |
| SH007          | 02/27/89     | 1   | 140                         | 28          | 2                    | 17          | 30               | 5 U           | 7 3     | 0 0025 U   | 15                          |
| SH007          | 05/31/89     | 2   | 200 V                       | 62 A        | 2 1 A                | 29 A        | 59 V             | 5 UV          | 7 2     | 0 0043 V   | 19 V                        |
| SH007          | 06/08/89     | 2   | 180 V                       | 37 V        | 0 51 V               | 34 A        | 86 V             | 5 UV          | 7 3     | 0 0025 U   | 32 A                        |
| SH007          | 08/01/89     | 3   | 170 V                       | 16 V        | 3 8 V                | 20 V        | 110 V            | 5 UV          | 7 3     | 0 01 UV    | 22 V                        |
| SH041          | 03/01/89     | 1   | 160 A                       | 62 A        | 0 29 A               | 17 A        | 48 V             | 5 UV          | 7 6     | 0 0025 UR  | 5 UA                        |

U=Analyzed but not detected J=Present below detection limit E=Estimated value  
A=Acceptable with qualifications V=Valid and acceptable R=Rejected Qtr=Quarter

Inorganic Concentrations for 1989 Background Surface Water Stations  
(Concentration units mg/l except pH)

page 2

| Station Number | Date Sampled | Qtr | Total Dissolved Solids, TDS | Chloride Cl | Nitrate/Nitrite as N | Sulfate SO4 | Bicarbonate HCO3 | Carbonate CO3 | pH unit | Cyanide CN | Total Suspended Solids, TSS |
|----------------|--------------|-----|-----------------------------|-------------|----------------------|-------------|------------------|---------------|---------|------------|-----------------------------|
| SW041          | 05/26/89     | 2   | 200 A                       | 6 A         | 0.05 UA              | 32 V        | 170 V            | 5 UV          | 7       | 0.0025 U   | 92 A                        |
| SW041          | 06/16/89     | 2   | 190 V                       | 4 A         | 0.05 UV              | 21 A        | 150 V            | 5 UV          | 7.5     | 0.0027 UV  | 90 V                        |
| SW041          | 11/20/89     | 4   | 120 A                       | 7 A         | 0.05 UV              | 48 V        | 160 V            | 5 UV          | 6.9     | 0.01 U     | 150                         |
| SW041          | 12/05/89     | 4   | 270                         | 6           | 0.12                 | 39          | 156              | 5 U           | 6.8     | 0.01 U     | 130                         |
| SW080          | 03/01/89     | 1   | 120 A                       | 10 A        | 1 UA                 | 16 A        | 150 V            | 5 UV          | 6.5     | 0.0025 UR  | 4200 A                      |
| SW080          | 06/16/89     | 2   | 310 V                       | 13 A        | 10 UV                | 50 UA       | 1900 V           | 5 UV          | 7.5     | 0.0076 V   | 25000 V                     |
| SW080          | 07/14/89     | 3   | 390 V                       | 16 V        | 0.05 UA              | 5 UA        | 1400 V           | 5 UV          | 7.4     | 0.01 UV    | 16000 V                     |
| SW080          | 09/19/89     | 3   | 210 A                       | 8 V         | 0.05 UV              | 5 UV        | 220 V            | 5 UV          | 6.9     | 0.0025 U   | 670 A                       |
| SW080          | 10/13/89     | 4   | 190 A                       | 7 V         | 0.05 UV              | 12 A        | 150 A            | 5 UA          | 6       |            | 180 A                       |
| SW080          | 11/20/89     | 4   | 18 A                        | 8 A         | 1 V                  | 20 V        | 850 V            | 5 UV          | 6.9     | 0.01 U     | 2000                        |
| SW080          | 12/05/89     | 4   | 250                         | 7           | 0.15                 | 23          | 120              | 5 U           | 6.9     | 0.01 U     | 480                         |
| SW104          | 03/02/89     | 1   | 290 A                       | 14 V        | 0.05 UV              | 5 UA        | 320 V            | 5 UV          | 7.1     | 0.0025 U   | 340 A                       |
| SW104          | 06/01/89     | 2   | 240 V                       | 7 V         | 0.05 UA              | 39 V        | 190 V            | 5 UV          | 7.5     | 0.0025 UV  | 980 A                       |
| SW104          | 06/16/89     | 2   | 190 V                       | 14 A        | 1.1 V                | 21 A        | 130 V            | 5 UV          | 7       | 0.0025 UV  | 1000 V                      |
| SW104          | 07/14/89     | 3   | 190 V                       | 11 V        | 0.16 A               | 17 A        | 150 V            | 5 UV          | 7       | 0.01 UV    | 3000 V                      |
| SW104          | 08/04/89     | 3   | 72 A                        | 13 V        | 0.1 V                | 27 A        | 130 V            | 5 UV          | 6.6     | 0.01 UV    | 2400 A                      |
| SW104          | 09/19/89     | 3   | 180 A                       | 12 V        | 0.91 V               | 19 V        | 120 V            | 5 UV          | 7.2     | 0.0025 U   | 10 A                        |
| SW104          | 10/13/89     | 4   | 180 A                       | 12 V        | 1 V                  | 20 A        | 120 A            | 5 UA          | 7.8     |            | 8 A                         |
| SW104          | 11/20/89     | 4   | 190 UA                      | 12 V        | 1 V                  | 62 V        | 100 V            | 5 UV          | 6.9     | 0.01 U     | 5 U                         |
| SW104          | 11/20/89     | 4   | 160 A                       | 13 A        | 1.6 V                | 17 V        | 120 V            | 5 UV          | 7.2     | 0.01 U     | 5 U                         |
| SW104          | 12/04/89     | 4   | .                           | .           | .                    | .           | .                | .             | .       | 0.01 U     | .                           |
| SW107          | 02/27/89     | 1   | .                           | .           | .                    | .           | .                | .             | .       | 0.0025 U   | .                           |
| SW107          | 02/28/89     | 1   | 160                         | 62          | 0.39                 | 16          | 48               | 5 U           | 7.7     | 0.0025 U   | 11                          |
| SW107          | 05/26/89     | 2   | 140 A                       | 17 A        | 0.05 UA              | 13 V        | 89 V             | 5 UV          | 7.7     | 0.0025 U   | 7 A                         |
| SW107          | 06/16/89     | 2   | 160 V                       | 18 A        | 0.05 UV              | 14 A        | 110 V            | 5 UV          | 8       | 0.0025 UV  | 5 UV                        |
| SW107          | 07/14/89     | 3   | 110 V                       | 4 V         | 4.3 A                | 5 UA        | 67 V             | 5 UV          | 6.8     | 0.01 UV    | 400 V                       |
| SW107          | 09/20/89     | 3   | 92 A                        | 10 V        | 0.05 UV              | 12 V        | 62 V             | 5 UV          | 7.4     | 0.0029 U   | 8 A                         |
| SW107          | 11/09/89     | 4   | 58 A                        | 10 V        | 0.05 UV              | 14 A        | 53 A             | 5 UA          | 7.5     | 0.01 U     | 18 A                        |
| SW107          | 12/04/89     | 4   | .                           | .           | .                    | .           | .                | .             | .       | .          | .                           |
| SW108          | 03/02/89     | 1   | 220 A                       | 5 A         | 0.3 V                | 33 A        | 200 V            | 5 UV          | 7.7     | 0.0025 U   | 5 UA                        |

U=Analyzed but not detected J=Present below detection limit E=Estimated value  
A=Acceptable with qualifications V=Valid and acceptable R=Rejected Qtr=Quarter

Inorganic Concentrations for 1989 Background Surface Water Stations  
(Concentration units mg/l except pH )

page 3

| Station Number | Date Sampled | Qtr | Total Dissolved Solids, TDS | Chloride Cl | Nitrate/Nitrite as N | Sulfate SO4 | Bicarbonate HCO3 | Carbonate CO3 | pH pH unit | Cyanide CN | Total Suspended Solids, TSS |
|----------------|--------------|-----|-----------------------------|-------------|----------------------|-------------|------------------|---------------|------------|------------|-----------------------------|
| SW108          | 05/30/89     | 2   | 280 V                       | 4 V         | 0 05 UV              | 46 V        | 230 V            | 5 UV          | 7 6        | 0 0025 UV  | 96 A                        |
| SW108          | 05/30/89     | 2   | 260 V                       | 5 V         | 0 05 UV              | 45 V        | 230 V            | 5 UV          | 7 6        | 0 0025 UV  | 92 A                        |
| SW108          | 06/15/89     | 2   | 310 A                       | 4 V         | 0 05 UV              | 52 V        | 230 V            | 5 UV          | 7.9        | 0.0025 U   | 41 A                        |
| SW108          | 07/13/89     | 3   | 460 V                       | 10 V        | 0.05 V               | 20 V        | 340 V            | 5 UV          | 7 6        | 0.01 UV    | 2500 V                      |
| SW108          | 12/05/89     | 4   | 1100                        | 6           | 11                   | 560         | 264              | 5 U           | 7 8        | 0 0452     | 5 U                         |

U=Analyzed but not detected J=Present below detection limit E=Estimated value . =Missing  
A=Acceptable with qualifications V=Valid and acceptable R=Rejected qtr=Quarter

Total Radiochemical Concentrations for 1989 Background Surface Water Stations  
(Concentration units pCi/L)

page 1

| Station Number | Date Sampled | Qtr | Gross Alpha | Gross Beta | Uranium 233,234 | Uranium 235 | Uranium 238 | Strontium 89,90 | Plutonium 239 | Americium 241 | Cesium 137 | Radium 226 | Radium 228 | Tritium  |
|----------------|--------------|-----|-------------|------------|-----------------|-------------|-------------|-----------------|---------------|---------------|------------|------------|------------|----------|
| SW004          | 03/02/89     | 1   | 1+3         | 0+3        | 9+3             | 0+1         | 5+2         | 2+4             | 0+02          | 0+02          | -3+6       |            |            | 70+150   |
| SW004          | 06/15/89     | 2   | 2+2         | 4+2        | 1+1+3           | 0+1         | 1+1+3       | 5+5             | 0+01          | 0+01          | 4+6        |            |            | -40+230  |
| SW005          | 02/28/89     | 1   | 2+2         | 4+2        | 2+2             | 0+1         | 0+1         | 3+1             | 01+02         | 0+02          | -4+5       |            |            | 140+140  |
| SW005          | 05/30/89     | 2   | -2+2        | 0+2        | 4+2             | 0+1         | 0+1         | 0+3             | 0+01          | 0+01          | -2+6       |            |            | -60+160  |
| SW005          | 06/09/89     | 2   | 13+2        | 4+2        | 2+2             | 0+1         | 0+1         | 1+3             | 0+01          | 01+01         | -2+5       | -1+2       |            | 0+150    |
| SW005          | 07/13/89     | 3   | 2+3         | 0+2        | .1+1            | 0+1         | 1+1         | 3+4             | 0+01          | 0+01          | 1+7+8      |            |            | -120+230 |
| SW005          | 08/01/89     | 3   | 2+3         | 5+2        | 2+2             | 0+1         | .2+1        | -2+6            | 0+01          | 0+01          | 3+6        |            |            | -120+220 |
| SW005          | 09/05/89     | 3   | 2+8         | 2+1        | 2+2             | 0+1         | 1+1         | .004+2          | -001+003      | -003+006      | -24+13     |            |            | -800+300 |
| SW005          | 10/02/89     | 4   | 5+7         | 1+5+1      | .47+57          | 12+23       | 35+4        | 75+51           | 018+015       | 014+012       | 04+71      |            |            | 10+240   |
| SW006          | 02/24/89     | 1   | 1+2         | 7+3        | .4+2            | 0+1         | 2+2         | 1+5+5           | 0+02          | 02+01         | -1+5       |            |            | 100+150  |
| SW006          | 02/24/89     | 1   | 1+2         | 8+3        | 4+1             | 0+1         | 3+2         | 1+1+5           | 0+02          | 01+03         | 1+5        |            |            | 100+150  |
| SW006          | 05/31/89     | 2   | 0+2         | 4+2        | .3+2            | 0+1         | .4+2        | .8+5            | 0+01          | 0+01          | 1+7        |            |            | 110+210  |
| SW006          | 07/13/89     | 3   | 3+3         | 3+2        | .1+1            | 0+1         | .1+1        | 1+3+5           | 0+01          | 0+01          | 1+7        |            |            | -120+230 |
| SW006          | 08/01/89     | 3   | 3+3         | 4+2        | 2+1             | 0+1         | 1+1         | 1+8+7           | 0+01          | 0+01          | 5+6        |            |            | 160+220  |
| SW006          | 08/01/89     | 3   | 5+3         | 5+3        | .3+2            | 0+1         | 3+2         | 1+5+6           | 0+01          | 0+01          | 2+6        | 1+3        |            | 110+220  |
| SW006          | 09/05/89     | 3   | .2+2        | 2+2        | 3+2             | 0+1         | 2+2         | 9+3             | 002+004       | 001+008       | 1+2        |            |            | -500+300 |
| SW006          | 09/05/89     | 3   | -3+7        | 3+2        | .3+3            | 0+1         | 2+2         | 9+3             | 006+005       | 03+01         | -005+12    |            |            | -600+300 |
| SW006          | 10/02/89     | 4   | 0+5         | 2+9+1.8    | -17+35          | -17+35      | 87+92       | 1.03+47         | 003+005       | 042+022       | 18+84      |            |            | -410+220 |
| SW006          | 10/02/89     | 4   | 1+7         | 4+7+2      | .29+44          | -1+2        | .1+2        | 1.95+1.02       | 018+012       | 097+054       | 04+68      |            |            | 50+260   |
| SW007          | 02/27/89     | 1   | 2+2         | 2+2        | 5+1             | .1+2        | .2+1.2      | 3+4             | 0+02          | -01+02        | 3+6        |            |            | 200+150  |
| SW007          | 05/31/89     | 2   | 2+3         | 3+3        | 1+1             | 0+1         | .1+1        | .2+4            | 02+01         | 0+01          | .3+5       |            |            | 550+220  |
| SW007          | 08/01/89     | 3   | 1+3         | 8+3        | 2+1             | 0+1         | .1+1        | .5+6            | 0+01          | 0+01          | 2+6        |            |            | -30+220  |
| SW041          | 03/01/89     | 1   | 1+2         | 2+2        | 1+1             | 0+1         | 1+1         | 2+5             | 0+02          | 02+03         | -1+5       |            |            | 100+140  |
| SW041          | 05/26/89     | 2   | 1+4         | 7+3        | .7+2            | 0+1         | 4+2         | 2+4             | 0+01          | 0+02          | -1+8       |            |            | 170+230  |
| SW041          | 06/16/89     | 2   | 57+14       | 41+7       | 3+2             | 0+1         | 2+2         | 6+3             | 04+01         | 0+01          | 3+5        | 2+3+5      |            | 120+150  |
| SW041          | 11/20/89     | 4   | 3.4+1       | 6.6+2      | 1+51+1          | 01          | 34+67       | 1+08+7          | 005+005       | -02+4         |            |            |            | 150+310  |
| SW080          | 03/01/89     | 1   | 250+140     | 200+110    | 2+2             | 0+1         | 3+2         | 1+1+6           | 1+1           | 1+07          | 12+2       | 5+5+9      | 11+4       | 190+140  |
| SW080          | 06/16/89     | 2   | 440+130     | 420+60     | 2+2             | 0+1         | 2+2         | -2+3            | 74+05         | 0+01          | .2+7       | 30+18      | 24+3       | 140+150  |
| SW080          | 07/14/89     | 3   | 88+36       | 87+22      | 0+1             | 0+1         | 0+1         | 9+9             | 4+4+1         | 0+01          | 6+7        | 4+9+6      | -1+5+8     | 80+220   |
| SW080          | 09/19/89     | 3   | 1+8+9       | 6+5+2.2    | 71+67           | 12+24       | 35+63       | 65+41           | 008+006       | 372+236       | 1+01+63    |            |            | -450+470 |

The table format is concentration + counting error Qtr=Quarter #Missing data

Total Radiochemical Concentrations for 1989 Background Surface Water Stations  
(Concentration Units pCi/l)

page 2

| Station Number | Date Sampled | qtr | Gross Alpha | Gross Beta | Uranium 233,234 | Uranium 235 | Uranium 238 | Strontium 89,90 | Plutonium 239 | Americium 241 | Cesium 137 | Radium 226 | Radium 228 | Tritium    |
|----------------|--------------|-----|-------------|------------|-----------------|-------------|-------------|-----------------|---------------|---------------|------------|------------|------------|------------|
| SW080          | 10/13/89     | 4   | .           |            | 56± 28          | 03± 07      | 77± 33      | 07± 3           | .009± 007     |               | 06± 47     |            |            | -210±580   |
| SW080          | 11/20/89     | 4   | 9.7±2       | 19.9±2 7   | .19± .66        | 19±.38      | 38± 54      | -.07± .32       | .038±.015     |               | 02± 43     |            |            | -6930±2980 |
| SW104          | 03/02/89     | 1   | 25±12       | 22±5       | 5± 2            | 0±.1        | 7±.2        | 1 1± 5          | 08± 03        | 0± 02         | - 3± 6     | 7± 4       |            | 50±150     |
| SW104          | 06/01/89     | 2   | 78±29       | 58±11      | 5± 2            | 0±.1        | 3± 2        | 4±.4            | .08± 03       | 01± 01        | 4± 7       | 1 4±1      |            | 110±210    |
| SW104          | 06/16/89     | 2   | 66±24       | 88±13      | 4± 2            | 0±.1        | .7±.2       | - 2± 4          | .19±.03       | 06± 02        | 8± 7       | 2± 5       |            | 250±150    |
| SW104          | 07/14/89     | 3   | 58±24       | 55±13      | .1±.1           | 0±.1        | 2±.1        | 5± 8            | 14±.02        | 02± 01        | 7±1 1      | 2 6± 5     |            | 190±220    |
| SW104          | 09/19/89     | 3   | 5± 7        | 2 1±1 7    | 2± 48           | - 29±.34    | 1±.59       | .29± 38         | 005± 01       | 095± 053      | .24± 43    |            |            | -170±220   |
| SW104          | 10/13/89     | 4   | .9± 4       | 3±1 5      | .52± 28         | 22±.18      | .59±.3      | .49± 36         | 003± 011      |               | -.06± 4    |            |            | -160±290   |
| SW104          | 11/20/89     | 4   | .8± 7       | 9±1 6      | -.12± 23        | .12±.23     | 12±.23      | .33± 34         | 006± 004      | .             | - 1± 37    |            |            | 980±270    |
| SW104          | 11/20/89     | 4   | .1± 7       | 1 7±1 7    | .09± 18         | 09±.18      | 09± 18      | .05± 38         | 004± 004      |               | - 23± 39   |            |            | -30±240    |
| SW107          | 02/28/89     | 1   | 1±2         | 1±2        | .1±.1           | 0±.1        | 0±.1        | - 1±.4          | 0± 02         | - 01± 02      | 0± 6       |            |            | 70±140     |
| SW107          | 05/26/89     | 2   | 0±2         | 3±2        | 4±.2            | 0±.1        | 4± 2        | 0±.4            | 0± 01         | 0± 02         | 1± 6       |            |            | 200±230    |
| SW107          | 06/16/89     | 2   | 2±2         | 3±2        | 1± 2            | 0±.1        | 0± 2        | .1± 3           | 0±.01         | 0± 01         | 1± 7       |            |            | 280±150    |
| SW107          | 07/14/89     | 3   | 35±8        | 16±3       | 1 1± 3          | 0±.1        | 1 4± 3      | 5± 8            | 0± 01         | .01± 01       | 3± 7       | 2± 5       |            | 40±220     |
| SW107          | 09/20/89     | 3   | .4±.4       | 3±1 7      | .54±.46         | 08±.15      | .38± 34     | 67± 37          | 02± 012       | 277±.098      | .18± 76    |            |            | 220±240    |
| SW108          | 03/02/89     | 1   | 6±5         | 1±3        | .8±.3           | 0±.1        | 4±.2        | - 1±.5          | .01± 02       | 0± 03         | - 2± 5     | 2± 2       |            | 120±150    |
| SW108          | 05/30/89     | 2   | -2±4        | 3±3        | .4±.2           | 0±.1        | 3± 2        | 2± 4            | 0± 01         | 0± 01         | - 6± 8     |            |            | 230±160    |
| SW108          | 05/30/89     | 2   | 1±4         | 2±3        | .4± 2           | 0±.1        | 2± 2        | - 3±.4          | 0± 01         | 0±.01         | .2±.6      |            |            | 550±210    |
| SW108          | 06/15/89     | 2   | 2±3         | 3±2        | 1.4± 3          | 1±.1        | .8±.3       | - 1± 4          | 0± 01         | 0±.01         | 2± 5       |            |            | 190±230    |
| SW108          | 07/13/89     | 3   | 85±42       | 60±16      | .6± 2           | 1± 1        | .4± 2       | 0±.4            | 0± 01         | 0±.01         | 4±1 2      | 19±4       | 12±3       | -80±230    |

The table format is concentration ± counting error qtr=Quarter #Missing data

Dissolved Radiochemical Concentrations for 1989 Background Surface Water Stations  
(Concentration units pCi/l)

page 1

| Station<br>Number | Date<br>Sampled | Qtr | Gross<br>Alpha | Gross<br>Beta | Uranium<br>233,234 | Uranium<br>235 | Uranium<br>238 | Strontium<br>89,90 | Plutonium<br>239 | Americium<br>241 | Cesium<br>137 | Radium<br>226 | Radium<br>228 | Tritium |
|-------------------|-----------------|-----|----------------|---------------|--------------------|----------------|----------------|--------------------|------------------|------------------|---------------|---------------|---------------|---------|
| SW004             | 03/02/89        | 1   | 0±2            | 1±3           |                    | 0±1            | 6±2            | - 5±.8             | 0±.02            | 0±.02            | 2±.6          |               |               |         |
| SW005             | 02/28/89        | 1   | 0±2            | 1±2           |                    | 0±1            | 3±.2           | - 2±.4             | 0±.02            | - 01±.03         | - 2±.5        |               |               |         |
| SW006             | 02/24/89        | 1   | 0±2            | 6±3           |                    | 0±1            | 2±.2           | 9±.5               | 0±.02            | 0±.02            | - 3±.7        |               |               |         |
| SW006             | 02/24/89        | 1   | 0±2            | 5±3           |                    | 0±.1           | 3±.2           | 1±.5               | .01±.02          | 0±.02            | 1±.5          |               |               |         |
| SW007             | 02/27/89        | 1   | -1±1           | 3±2           |                    | 1±.2           | 1±1.2          | 1±.4               | 0±.02            | - 01±.02         | 1±.6          |               |               |         |
| SW041             | 03/01/89        | 1   | -1±2           | 3±2           |                    | 0±.1           | 0±1            | 0±.7               | 0±.02            | - 01±.02         | - 1±.5        |               |               |         |
| SW080             | 03/01/89        | 1   | 0±2            | -2±2          |                    | 0±.1           | - 1±.1         | 0±.4               | 01±.02           | 0±.02            | - 2±.6        |               |               |         |
| SW104             | 03/02/89        | 1   | 4±5            | 1±3           |                    | .3±.1          | 1.7±.4         | 8±.4               | 01±.02           | 0±.03            | - 5±.6        |               |               |         |
| SW107             | 02/28/89        | 1   | 0±2            | 0±2           |                    | 0±1            | 1±1            | - 1±.5             | 0±.02            | 0±.02            | - 2±.6        |               |               |         |
| SW108             | 03/02/89        | 1   | 3±4            | 0±3           |                    | 0±1            | 5±.2           | - 3±.4             | 0±.02            | 0±.02            | - 1±.6        |               |               |         |

The table format is    concentration ± counting error    Qtr=Quarter    . =Missing data

# Field Parameters for 1989 Background Surface Water Stations

page 1

| Station Number | Date Sampled | Qtr | Temperature degrees C | pH unit | Oxygen mg/L | Conductivity umhos/cm |
|----------------|--------------|-----|-----------------------|---------|-------------|-----------------------|
| SW004          | 03/02/89     | 1   | 3                     | 6.50    | 7           | 210                   |
| SW004          | 06/15/89     | 2   | 26                    | 8.20    | 19          | 300                   |
| SW005          | 02/28/89     | 1   | 27                    | 6.28    | 4           | 150                   |
| SW005          | 05/30/89     | 2   | 12                    | 7.20    | 34          | 70                    |
| SW005          | 06/09/89     | 2   | 16                    | 8.70    | 18          | 80                    |
| SW005          | 07/13/89     | 3   | 18                    | 7.20    | 28          | 200                   |
| SW005          | 08/01/89     | 3   | 20                    | 7.80    | 13          | 190                   |
| SW005          | 09/05/89     | 3   | 18                    | 7.50    | 64          | 210                   |
| SW005          | 10/02/89     | 4   | 16                    | 7.40    | 26          | 95                    |
| SW005          | 11/01/89     | 4   | 10                    | 7.30    | 43          | 200                   |
| SW005          | 12/04/89     | 4   | 11                    | 6.00    | 58          | 220                   |
| SW006          | 02/24/89     | 1   | 4                     | 6.45    | 31          | 60                    |
| SW006          | 02/24/89     | 1   | 4                     | 6.45    | 31          | 60                    |
| SW006          | 05/31/89     | 2   | 14                    | 7.00    | 45          | 90                    |
| SW006          | 06/08/89     | 2   | 20                    | 8.00    | 26          | 242                   |
| SW006          | 07/13/89     | 3   | 22                    | 7.40    | 25          | 220                   |
| SW006          | 08/01/89     | 3   | 23                    | 7.80    |             | 210                   |
| SW006          | 08/01/89     | 3   | 23                    | 7.80    |             | 210                   |
| SW006          | 09/05/89     | 3   | 20                    | 7.70    | 39          | 240                   |
| SW006          | 09/05/89     | 3   | 20                    | 7.70    | 39          | 240                   |
| SW006          | 10/02/89     | 4   | 12                    | 7.40    | 19          | 77                    |
| SW006          | 10/02/89     | 4   | 12                    | 7.40    | 19          | 77                    |
| SW006          | 11/01/89     | 4   | 3                     | 9.10    | 62          | 340                   |
| SW006          | 12/04/89     | 4   | 5                     | 8.40    | 74          | 400                   |
| SW006          | 12/04/89     | 4   | 5                     | 8.40    | 74          | 400                   |
| SW007          | 02/27/89     | 1   | 5                     | 6.40    | 13          | 130                   |
| SW007          | 05/31/89     | 2   | 15                    | 6.50    | 59          | 285                   |
| SW007          | 06/08/89     | 2   | 24                    | 7.20    | 26          | 400                   |
| SW007          | 08/01/89     | 3   | 21                    | 8.40    |             | 360                   |
| SW041          | 03/01/89     | 1   | 05                    | 5.00    | 55          | 200                   |
| SW041          | 05/26/89     | 2   | 19                    | 6.80    |             | 165                   |

U=Analyzed but not detected J=Present below detection limit E=Estimated value #Missing  
A=Acceptable with qualifications V=Valid and acceptable R=Rejected Qtr=Quarter

Field Parameters for 1989 Background Surface Water Stations

| Station Number | Date Sampled | Qtr | Temperature<br>degrees C | pH<br>pH unit | Oxygen<br>mg/L | Conductivity<br>umhos/cm |
|----------------|--------------|-----|--------------------------|---------------|----------------|--------------------------|
| SW041          | 06/16/89     | 2   | 21                       | 7.20          | 0.9            | 260                      |
| SW041          | 11/20/89     | 4   | 12                       | 6.60          | 4.2            | 215                      |
| SW041          | 12/05/89     | 4   | 10                       | 7.00          |                | 500                      |
| SW080          | 03/01/89     | 1   | 0.6                      | 6.00          | 3.8            | 160                      |
| SW080          | 06/16/89     | 2   | 16                       | 7.20          |                | 250                      |
| SW080          | 07/14/89     | 3   | 23                       | 7.00          | 0.1            | 710                      |
| SW080          | 08/10/89     | 3   | 25                       | 7.10          | 2.9            | 320                      |
| SW080          | 09/19/89     | 3   | 19                       | 6.80          |                | 230                      |
| SW080          | 10/13/89     | 4   | 22                       | 7.50          | 2.7            | 250                      |
| SW080          | 11/20/89     | 4   | 14                       | 6.50          | 0.3            | 175                      |
| SW080          | 12/05/89     | 4   | 8                        | 7.00          |                | 260                      |
| SW104          | 03/02/89     | 1   | 1                        | 5.90          | 3              | 410                      |
| SW104          | 06/01/89     | 2   | 14                       | 7.50          | 5.3            | 140                      |
| SW104          | 06/16/89     | 2   | 15                       | 7.40          | 0.7            | 240                      |
| SW104          | 07/14/89     | 3   | 18                       | 7.20          | 0.6            | 260                      |
| SW104          | 08/04/89     | 3   | 20                       | 8.00          | 5.6            | 250                      |
| SW104          | 09/19/89     | 3   | 19                       | 7.30          | 0.8            | 210                      |
| SW104          | 10/13/89     | 4   | 20                       | 8.20          | 10             | 260                      |
| SW104          | 11/20/89     | 4   | 10                       | 7.50          | 6.1            | 175                      |
| SW104          | 11/20/89     | 4   | 10                       | 7.50          | 6.1            | 175                      |
| SW104          | 12/04/89     | 4   | 10                       | 7.40          | 7.6            | 480                      |
| SW107          | 02/27/89     | 1   | 0.5                      | 5.60          | 5.3            | 190                      |
| SW107          | 05/26/89     | 2   | 21                       | 7.50          | 3.2            | 192                      |
| SW107          | 06/16/89     | 2   | 24                       | 7.80          | 1.5            | 210                      |
| SW107          | 07/14/89     | 3   | 25                       | 7.90          | 1.7            | 360                      |
| SW107          | 09/20/89     | 3   | 16                       | 6.80          | 1.3            | 140                      |
| SW107          | 11/09/89     | 4   | 10                       | 8.50          | 4.7            | 130                      |
| SW107          | 12/04/89     | 4   | 8                        | 6.40          | 6.3            | 140                      |
| SW108          | 03/02/89     | 1   | 1                        | 5.80          | 7.4            | 285                      |
| SW108          | 05/30/89     | 2   | 13                       | 7.40          |                | 300                      |
| SW108          | 05/30/89     | 2   | 13                       | 7.40          |                | 300                      |

U=Analyzed but not detected  
A=Acceptable with qualifications

J=Present below detection limit  
V=Valid and acceptable

E=Estimated value  
R=Rejected

=Missing  
Qtr=Quarter

Field Parameters for 1989 Background Surface Water Stations

| Station<br>Number | Date<br>Sampled | Qtr | Temperature<br>degrees C | pH<br>pH unit | Oxygen<br>mg/L | Conductivity<br>umhos/cm |
|-------------------|-----------------|-----|--------------------------|---------------|----------------|--------------------------|
| SW108             | 06/15/89        | 2   | 26                       | 7.80          | 1.6            | 400                      |
| SW108             | 07/13/89        | 3   | 35                       | 9.80          | 11             | 240                      |
| SW108             | 12/05/89        | 4   | 7                        | 8.80          | 0.1            | 1400                     |

U=Analyzed but not detected      J=Present below detection limit      E=Estimated value      . =Missing  
A=Acceptable with qualifications      V=Valid and acceptable      R=Rejected      Qtr=Quarter

Total Samples, by analyte group, for 1989 Background Ground Water Stations

| Station Number | Total Metals | Dissolved Metals | Inorganics | Total Radiochemicals | Dissolved Radiochemicals | Field Parameters |
|----------------|--------------|------------------|------------|----------------------|--------------------------|------------------|
| B102289        | 0            | 2                | 3          | 0                    | 3                        | 3                |
| B102389        | 0            | 2                | 3          | 0                    | 3                        | 2                |
| B200589        | 0            | 2                | 4          | 0                    | 3                        | 4                |
| B200689        | 0            | 3                | 2          | 0                    | 3                        | 3                |
| B200789        | 0            | 3                | 5          | 0                    | 5                        | 5                |
| B200889        | 0            | 3                | 4          | 1                    | 4                        | 4                |
| B201189        | 0            | 3                | 3          | 0                    | 2                        | 3                |
| B201289        | 0            | 2                | 2          | 0                    | 2                        | 2                |
| B202489        | 0            | 3                | 3          | 0                    | 4                        | 4                |
| B202589        | 0            | 3                | 3          | 0                    | 3                        | 3                |
| B203189        | 0            | 2                | 2          | 0                    | 3                        | 2                |
| B203289        | 0            | 3                | 3          | 0                    | 2                        | 3                |
| B203489        | 0            | 1                | 1          | 0                    | 3                        | 2                |
| B203589        | 0            | 1                | 0          | 0                    | 2                        | 2                |
| B203689        | 0            | 2                | 2          | 0                    | 2                        | 2                |
| B203789        | 0            | 3                | 3          | 0                    | 2                        | 3                |
| B203889        | 0            | 2                | 0          | 0                    | 3                        | 1                |
| B203989        | 0            | 3                | 3          | 0                    | 2                        | 3                |
| B204089        | 0            | 2                | 1          | 0                    | 3                        | 3                |
| B204189        | 0            | 3                | 2          | 0                    | 3                        | 3                |
| B205589        | 0            | 2                | 2          | 0                    | 2                        | 2                |
| B302089        | 0            | 1                | 0          | 0                    | 0                        | 1                |
| B302789        | 0            | 1                | 1          | 0                    | 1                        | 1                |
| B302889        | 0            | 2                | 2          | 0                    | 1                        | 3                |
| B302989        | 0            | 3                | 4          | 0                    | 4                        | 3                |
| B303089        | 0            | 0                | 1          | 0                    | 0                        | 1                |
| B304289        | 0            | 4                | 4          | 0                    | 4                        | 4                |
| B304889        | 0            | 1                | 1          | 0                    | 2                        | 1                |
| B304989        | 0            | 2                | 2          | 0                    | 3                        | 3                |
| B305389        | 0            | 3                | 3          | 0                    | 3                        | 3                |
| B400189        | 0            | 2                | 3          | 0                    | 2                        | 3                |
| B400289        | 0            | 2                | 3          | 0                    | 2                        | 3                |
| B400389        | 0            | 3                | 3          | 0                    | 1                        | 2                |
| B400489        | 0            | 2                | 2          | 0                    | 2                        | 2                |
| B401989        | 0            | 4                | 4          | 0                    | 3                        | 4                |
| B402189        | 0            | 3                | 4          | 0                    | 4                        | 4                |

Total Samples, by analyte group, for 1989 Background Ground Water Stations

| <u>Station<br/>Number</u> | <u>Total<br/>Metals</u> | <u>Dissolved<br/>Metals</u> | <u>Inorganics</u> | <u>Total<br/>Radiochemicals</u> | <u>Dissolved<br/>Radiochemicals</u> | <u>Field<br/>Parameters</u> |
|---------------------------|-------------------------|-----------------------------|-------------------|---------------------------------|-------------------------------------|-----------------------------|
| B402689                   | 0                       | 1                           | 1                 | 0                               | 1                                   | 1                           |
| B405289                   | 0                       | 1                           | 1                 | 0                               | 2                                   | 0                           |
| B405489                   | 0                       | 3                           | 3                 | 0                               | 2                                   | 3                           |
| B405586                   | 0                       | 5                           | 4                 | 1                               | 1                                   | 6                           |
| B405689                   | 0                       | 2                           | 3                 | 0                               | 3                                   | 3                           |
| B405789                   | 0                       | 3                           | 3                 | 0                               | 2                                   | 3                           |
| B405889                   | 0                       | 3                           | 4                 | 0                               | 4                                   | 4                           |

Dissolved Metal Concentrations for 1989 Background Ground Water Stations  
(Concentration units mg/L)

page 1

| Station Number | Date Sampled     | Aluminum (Al) | Antimony (Sb) | Arsenic (As) | Barium (Ba) | Beryllium (Be) | Cadmium (Cd) | Calcium (Ca) | Cesium (Cs) | Chromium (Cr) | Cobalt (Co) | Copper (Cu) | Iron (Fe) | Lead (Pb) | Lithium (Li) |
|----------------|------------------|---------------|---------------|--------------|-------------|----------------|--------------|--------------|-------------|---------------|-------------|-------------|-----------|-----------|--------------|
| 1              | B102289 04/25/89 | 2 R           | .06 UV        | .01 UV       | 2 UV        | .005 UA        | .005 UV      | 18.9 V       | 1 UR        | .01 UV        | .05 UV      | .025 UR     | 1 UA      | .005 UA   | .01 UV       |
| 2              | B102289 10/13/89 | 2 U           | .06 U         | .01 U        | 2 U         | .005 U         | .005 U       | 18.9         | 1 U         | .01 U         | .05 U       | .025 U      | 1 U       | .005 U    | 1 U          |
| 3              | B102389 04/25/89 | 2 UV          | .06 UV        | .01 UA       | 2 UV        | .005 UA        | .005 UR      | 36.4 V       | 1 UR        | .01 UV        | .05 UV      | .025 UR     | .944 V    | .005 UA   | .0116 V      |
| 4              | B102389 07/14/89 | 2 UA          | .06 UV        | .01 UA       | 2 UV        | .005 UV        | .005 UV      | 38.2 V       | 1 UV        | .01 UV        | .05 UV      | .025 UA     | .49 V     | .005 UA   | 1 UV         |
| 5              | B200589 06/07/89 | 2 UA          | .06 UV        | .01 UR       | .2 UA       | .005 UA        | .005 UV      | 24.2 A       | 1 UV        | .01 UV        | .05 UV      | .025 UA     | 1 UA      | .005 UA   | 1 UR         |
| 6              | B200589 11/06/89 | 2 U           | .06 U         | .01 U        | 2 U         | .005 U         | .005 U       | 20.5         | 2.5 U       | .01 U         | .05 U       | .025 U      | 1 U       | .003 U    | 1 U          |
| 7              | B200689 06/07/89 | 2 UA          | .06 UV        | .01 UR       | 2 UA        | .005 UV        | .005 UV      | 34.6 A       | .1 UV       | .01 UV        | .05 UV      | .025 UA     | 1 UA      | .005 UA   | 1 UR         |
| 8              | B200689 07/27/89 | 2 UA          | .06 UV        | .01 UA       | 2 UA        | .005 UV        | .005 UV      | 32.1 V       | 1 UV        | .01 UA        | .05 UV      | .025 UR     | 1 UR      | .005 UA   | 1 UV         |
| 9              | B200689 11/03/89 | 3 U           | 5 U           | .002 U       | .0625       | .002 U         | .0058        | 29.8         | 1 U         | .02 U         | .02 U       | .02 U       | .03 U     | .002 U    | .009         |
| 10             | B200789 06/06/89 | 2 UA          | .0265 UV      | .01 UR       | .0773       | .005 UV        | .005 UV      | 39.3 V       | 1 UV        | .01 UV        | .05 UV      | .025 UA     | 266 A     | .005 UA   | 1 UV         |

| Station Number | Date Sampled     | Magnesium (Mg) | Manganese (Mn) | Mercury (Hg) | Molybdenum (Mo) | Nickel (Ni) | Potassium (K) | Selenium (Se) | Silver (Ag) | Sodium (Na) | Strontium (Sr) | Thallium (Tl) | Tin (Sn) | Vanadium (V) | Zinc (Zn) |
|----------------|------------------|----------------|----------------|--------------|-----------------|-------------|---------------|---------------|-------------|-------------|----------------|---------------|----------|--------------|-----------|
| 1              | B102289 04/25/89 | 5 UV           | .0649 V        | .0003 A      | .01 UV          | .04 UR      | 5 UA          | .005 UR       | .01 UV      | 19.3 V      | 1 UV           | .04 UA        | 1 UV     | .05 U        | .02 UA    |
| 2              | B102289 10/13/89 | 5 U            | .041           | .0002 U      | 1 U             | .04 U       | 5 U           | .005 U        | .01 U       | 15.2        | 1 U            | .01 U         | 1 U      | .05 U        | .0306     |
| 3              | B102389 04/25/89 | 8.61 V         | .208 V         | .0002 UR     | .01 UV          | .04 UV      | 5 UA          | .005 UR       | .01 UV      | 34.7 V      | 1 UV           | .04 UA        | .1 UV    | .05 U        | .02 UA    |
| 4              | B102389 07/14/89 | 9.64 V         | .337 V         | .0002 UV     | 1 UV            | .04 UR      | 5 UA          | .005 UA       | .01 UV      | 30.3 V      | 1 UV           | .01 UV        | 1 UV     | .05 U        | .02 UA    |
| 5              | B200589 06/07/89 | 5 UA           | .0615 A        | .0002 UV     | .1 UV           | .04 UV      | 5 UA          | .005 UA       | .01 UA      | 8.03 V      | 1 UV           | .01 UV        | 1 UV     | .05 U        | .0289 A   |
| 6              | B200589 11/06/89 | 5 U            | .015 U         | .0002 U      | 1 U             | .04 U       | 5 U           | .005 U        | .01 U       | 8.1         | 1 U            | .01 U         | 1 U      | .05 U        | .02 U     |
| 7              | B200689 06/07/89 | 5 UA           | .0187 A        | .0002 UV     | .1 UV           | .04 UV      | 5 UA          | .005 UA       | .01 UA      | 7.35 V      | 13 A           | .01 UA        | 1 UV     | .05 U        | .0405 A   |
| 8              | B200689 07/27/89 | 5 UV           | .0242 V        | .0002 UV     | 1 UV            | .04 UA      | 5 UA          | .0102 A       | .01 UA      | 7.36 V      | 1 UV           | .01 UV        | 1 UV     | .05 U        | .02 UV    |
| 9              | B200689 11/03/89 | 3.99           | .0194          | .0002 U      | 5 U             | .02 U       | 798           | .002 U        | .03 U       | 7           | 123            | .003 U        | 1 U      | .01 U        | .01 U     |
| 10             | B200789 06/06/89 | 5.29 V         | .0201 A        | .0002 UV     | 1 UV            | .0432 A     | 5 UA          | .05 UV        | .01 UA      | 8.36 V      | 159 A          | .01 UA        | 5 UV     | .05 U        | 141 A     |

U=Analyzed but not detected J=Present below detection limit E=Estimated value =Missing  
A=Acceptable with qualifications V=Valid and acceptable R=Rejected Qtr=Quarter

Dissolved Metal Concentrations for 1989 Background Ground Water Stations  
(Concentration units mg/l)

page 2

| Station Number | Date Sampled | Aluminum (Al) | Antimony (Sb) | Arsenic (As) | Barium (Ba) | Beryllium (Be) | Cadmium (Cd) | Calcium (Ca) | Cesium (Cs) | Chromium (Cr) | Cobalt (Co) | Copper (Cu) | Iron (Fe) | Lead (Pb) | Lithium (Li) |
|----------------|--------------|---------------|---------------|--------------|-------------|----------------|--------------|--------------|-------------|---------------|-------------|-------------|-----------|-----------|--------------|
| 11 B200789     | 07/31/89     | 3             | 06 UV         | .01 UV       | 2 UV        | .005 UV        | .005 UV      | 35 V         | 1 UV        | 01 UV         | 05 UV       | 025 UA      | 1 UR      | 005 UA    | 1 UV         |
| 12 B200789     | 10/11/89     | 4             | .5 UA         | 002 UV       | 063 V       | .002 UA        | 0111 A       | 32 2 V       | 1 UV        | 02 UV         | 02 UV       | 0201 A      | 0754 A    | .002 UA   | 008 V        |
| 13 B200889     | 06/05/89     | 2             | .2 UA         | .01 UV       | 2 UV        | .005 UV        | 005 UA       | 44 8 V       | 1 UV        | .01 UV        | 05 UV       | 025 UV      | .129 A    | 005 UA    | 01 UV        |
| 14 B200889     | 07/27/89     | 3             | .2 UA         | .01 UV       | 2 UA        | .005 UV        | 005 UV       | 41 9 V       | 1 UV        | 01 UA         | .05 UV      | .025 UV     | .1 UR     | 005 UV    | 1 UV         |
| 15 B200889     | 10/05/89     | 4             | 0828          | 002 U        | 0867        | 002 U          | 004 U        | 41 8         | 1 U         | 02 U          | 02 U        | 02 U        | 238       | 002 U     | .01          |
| 16 B201189     | 05/05/89     | 2             | 2 U           | 01 U         | 2 U         | 005 U          | 005 U        | 76 8         | 1 U         | 01 U          | 05 U        | 025 U       | 1 U       | .005 U    | 172          |
| 17 B201189     | 07/21/89     | 3             | 2 UA          | .01 UR       | 2 UA        | 005 UV         | 005 UV       | 82 3 V       | 1 UV        | 01 UA         | 05 UV       | 025 UR      | 1 UR      | 0396 V    | 184 V        |
| 18 B201189     | 10/26/89     | 4             | 2 U           | .01 U        | .2 U        | 005 U          | 005 U        | 76 9         | 1 U         | .01 U         | 05 U        | 025 U       | 1 U       | 005 U     | 175          |
| 19 B201289     | 07/28/89     | 3             | .32 A         | 01 UR        | 2 UV        | 005 UV         | 005 UV       | 180 V        | 1 UV        | 01 UV         | 05 UV       | 025 UR      | 247 A     | 005 UA    | 184 V        |
| 20 B201289     | 10/26/89     | 4             | .2 U          | 01 U         | 2 U         | 005 U          | 005 U        | 196          | 1 U         | 01 U          | 05 U        | 025 U       | 1 U       | 005 U     | .215         |

| Station Number | Date Sampled | Magnesium (Mg) | Manganese (Mn) | Mercury (Hg) | Molybdenum (Mo) | Nickel (Ni) | Potassium (K) | Selenium (Se) | Silver (Ag) | Sodium (Na) | Strontium (Sr) | Thallium (Tl) | Tin (Sn) | Vanadium (V) | Zinc (Zn) |
|----------------|--------------|----------------|----------------|--------------|-----------------|-------------|---------------|---------------|-------------|-------------|----------------|---------------|----------|--------------|-----------|
| 11 B200789     | 07/31/89     | 5 UV           | 015 UV         | 0002 UV      | 1 UV            | .04 UV      | 5 UA          | 005 UA        | .01 UA      | 7 35 A      | 1 UV           | 01 UV         | 1 UV     | 05 U         | 02 UA     |
| 12 B200789     | 10/11/89     | 4 48 V         | 01 UV          | 0002 UV      | 5 UV            | 02 UV       | .208 A        | 002 UV        | 03 UV       | 7 54 V      | 146 V          | 003 UV        | 1 UA     | 01 U         | 0493 V    |
| 13 B200889     | 06/05/89     | 5 79 V         | 0283 V         | 0002 UV      | 0136 A          | 04 UA       | 5 UA          | 005 UR        | 01 UA       | 8 55 V      | 1 UA           | 01 UA         | 1 UA     | 05 U         | .02 UR    |
| 14 B200889     | 07/27/89     | 5 72 V         | 0197 V         | .0002 UV     | 1 UV            | 04 UA       | 5 UA          | 005 UR        | 01 UR       | 7 7 V       | 1 UV           | 01 UV         | 1 UV     | 05 U         | 02 UV     |
| 15 B200889     | 10/05/89     | 5 48           | 0231           | .0002 U      | 5 U             | 02 U        | 964           | 002 U         | 03 U        | 8 26        | 192            | 003 U         | 1 U      | 01 U         | 0212      |
| 16 B201189     | 05/05/89     | 15 3           | 088            | 0002 U       | 01 U            | .04 U       | 5 U           | 005 U         | 01 U        | 98.7        | 1 U            | 04 U          | 1 U      | 05 U         | 02 U      |
| 17 B201189     | 07/21/89     | 16 V           | 153 V          | 0002 UV      | 1 UV            | 04 UA       | 5 UA          | 005 UR        | 01 UR       | 99 5 V      | 1 UV           | 01 UR         | 1 UV     | 05 U         | 0203 V    |
| 18 B201189     | 10/26/89     | 14 6           | 0784           | .0002 U      | .1 U            | .04 U       | 5 U           | 005 U         | 01 U        | 89 4        | 1 U            | 01 U          | 1 U      | 05 U         | 02 U      |
| 19 B201289     | 07/28/89     | 42 7 V         | 168 V          | .0002 UV     | .1 UV           | 04 UV       | 11 3 V        | 185 V         | 01 UV       | 145 V       | 1 43 V         | 01 UA         | 1 UV     | 05 U         | 02 UA     |
| 20 B201289     | 10/26/89     | 48 6           | 0774           | 0004         | 1 U             | 04 U        | 7 48          | 221           | 01 U        | 164         | 1 72           | 01 U          | 1 U      | 05 U         | 0431      |

U=Analyzed but not detected J=Present below detection limit E=Estimated value =Missing  
A=Acceptable with qualifications V=Valid and acceptable R=Rejected qtr=Quarter

Dissolved Metal Concentrations for 1989 Background Ground Water Stations  
(Concentration units mg/l)

page 3

| Station Number | Date Sampled     | Aluminum (Al) | Antimony (Sb) | Arsenic (As) | Barium (Ba) | Beryllium (Be) | Cadmium (Cd) | Calcium (Ca) | Cesium (Cs) | Chromium (Cr) | Cobalt (Co) | Copper (Cu) | Iron (Fe) | Lead (Pb) | Lithium (Li) |
|----------------|------------------|---------------|---------------|--------------|-------------|----------------|--------------|--------------|-------------|---------------|-------------|-------------|-----------|-----------|--------------|
| 21             | 8202489 04/24/89 | 2             | 06 U          | 01 U         | .2 U        | .005 U         | 005 U        | 40 3         | 1 U         | 01 U          | 05 U        | .025 U      | 1 U       | 005 U     | 0133         |
| 22             | 8202489 04/24/89 | 2             | 06 U          | 01 U         | .2 U        | .005 U         | 005 U        | 41 9         | 1 U         | 01 U          | 05 U        | 025 U       | 1 U       | 005 U     | 0134         |
| 23             | 8202489 10/12/89 | 4             | 06 UV         | 01 UV        | .2 UV       | .005 UV        | 005 UV       | 57 8 V       | 2 5 UV      | 01 UA         | 05 UV       | 025 UA      | 1 UV      | 003 UA    | 1 UV         |
| 24             | 8202589 04/26/89 | 2             | .06 UV        | .01 UV       | .2 UV       | .005 UA        | 005 UR       | 40 3 V       | 1 UR        | .01 UV        | 05 UV       | .025 UR     | 1 UA      | 005 UA    | 0154 V       |
| 25             | 8202589 07/14/89 | 3             | 06 UV         | 01 UA        | 2 UV        | 005 UV         | 005 UV       | 52 V         | 1 UV        | 01 UV         | 05 UV       | 025 UA      | 1 UV      | 005 UA    | .1 UV        |
| 26             | 8202589 10/13/89 | 4             | 06 U          | 01 U         | 2 U         | 005 U          | 005 U        | 59 9         | 1 U         | 01 U          | 05 U        | 025 U       | .882      | .005 U    | .1 U         |
| 27             | 8203189 08/18/89 | 3             | 06 UV         | .01 UV       | 2 UV        | 005 UV         | 005 UV       | 31 8 V       | 1 UV        | 01 UA         | 05 UV       | 025 UA      | 1 UV      | 003 UV    | 1 UV         |
| 28             | 8203189 10/24/89 | 4             | 5 U           | .002 U       | .05 U       | 002 U          | 004 U        | 128          | 1 U         | 02 U          | 02 U        | .0477       | 0909      | 0034      | 4            |
| 29             | 8203289 06/20/89 | 2             | 06 UA         | 01 UA        | 2 UV        | .005 UV        | 005 UV       | 51 1 V       | 1 UV        | 01 UV         | 05 UR       | .025 UV     | 1 UA      | 005 UR    | 1 UV         |
| 30             | 8203289 08/07/89 | 3             | 06 UA         | 01 UV        | 2 UA        | 005 UV         | .005 UV      | 48 9 V       | 1 UV        | 01 UV         | 05 UV       | 025 UV      | 1 UR      | 005 UA    | 1 UV         |
| 31             | 8203289 11/06/89 | 4             | 06 U          | 01 U         | 2 U         | 005 U          | 005 U        | 49 8         | 2 5 U       | 01 U          | 05 U        | 025 U       | 1 U       | 003 U     | 1 U          |

| Station Number | Date Sampled     | Magnesium (Mg) | Manganese (Mn) | Mercury (Hg) | Molybdenum (Mo) | Nickel (Ni) | Potassium (K) | Selenium (Se) | Silver (Ag) | Sodium (Na) | Strontium (Sr) | Thallium (Tl) | Tin (Sn) | Vanadium (V) | Zinc (Zn) |
|----------------|------------------|----------------|----------------|--------------|-----------------|-------------|---------------|---------------|-------------|-------------|----------------|---------------|----------|--------------|-----------|
| 21             | 8202489 04/24/89 | 8.19           | .015 U         | 0002 U       | .01 U           | .04 U       | 5 U           | 005 U         | 01 U        | 27 3        | 1 U            | 04 U          | 1 U      | 05 U         | 02 U      |
| 22             | 8202489 04/24/89 | 8 5            | .015 U         | 0003         | 01 U            | .04 U       | 5 U           | 005 U         | 01 U        | 25 9        | 1 U            | 04 U          | 1 U      | .05 U        | 02 U      |
| 23             | 8202489 10/12/89 | 12 4 V         | .015 UA        | 0002 UV      | 1 UV            | .04 UV      | 5 UR          | 005 UV        | 01 UV       | 30 4 V      | 34 A           | 01 UA         | 1 UV     | 05 U         | 0791 A    |
| 24             | 8202589 04/26/89 | 8 51 V         | .015 UA        | 0002 UR      | 01 UV           | 04 UR       | 5 UA          | 005 UR        | .01 UV      | 33 8 V      | 1 UV           | .04 UA        | 1 UV     | 05 U         | 02 UA     |
| 25             | 8202589 07/14/89 | 11 5 V         | 015 UV         | 0002 UV      | 1 UV            | .04 UR      | 5 UA          | 005 UA        | 01 UV       | 31 8 V      | 1 UV           | .01 UV        | 1 UV     | 05 U         | 02 UV     |
| 26             | 8202589 10/13/89 | 13 1           | 0878           | 0002 U       | 1 U             | .04 U       | 5 U           | 005 U         | 01 U        | 35 2        | 1 U            | 01 U          | 1 U      | 05 U         | 0848      |
| 27             | 8203189 08/18/89 | 6.31 V         | 279 V          | 0002 UV      | 1 UV            | 04 UR       | 5 UA          | 005 UA        | 01 UV       | 17 8 V      | 1 UV           | 01 UV         | .1 UV    | 05 U         | 02 UR     |
| 28             | 8203189 10/24/89 | 179            | 115            | 0002 U       | 5 U             | 02 U        | 2 56          | 0156          | 03 U        | 714         | 7 12           | 003 U         | 1 U      | .01 U        | 0256      |
| 29             | 8203289 06/20/89 | 45 3 V         | 126 V          | .0002 UV     | 1 UV            | 04 UR       | 5 UA          | 005 UA        | 01 UV       | 26 2 V      | 1 UV           | 01 UA         | 1 UV     | 05 U         | 0594 A    |
| 30             | 8203289 08/07/89 | 9 77 V         | 169 V          | 0004 V       | 1 UV            | 04 UV       | 5 UV          | 005 UA        | 01 UV       | 24 3 A      | 1 UV           | 01 UV         | 1 UV     | 05 U         | 02 UA     |
| 31             | 8203289 11/06/89 | 10 3           | 0891           | 0002 U       | 1 U             | 04 U        | 5 U           | 005 U         | 01 U        | 25          | 322            | 01 U          | 1 U      | 05 U         | 0359      |

U=Analyzed but not detected J=Present below detection limit E=Estimated value =Missing  
A=Acceptable with qualifications V=Valid and acceptable R=Rejected Qtr=Quarter

Dissolved Metal Concentrations for 1989 Background Ground Water Stations  
(Concentration units mg/L)

page 4

| Station Number | Date Sampled | Qtr   | Aluminum (Al) | Antimony (Sb) | Arsenic (As) | Barium (Ba) | Beryllium (Be) | Cadmium (Cd) | Calcium (Ca) | Cesium (Cs) | Chromium (Cr) | Cobalt (Co) | Copper (Cu) | Iron (Fe) | Lead (Pb) | Lithium (Li) |
|----------------|--------------|-------|---------------|---------------|--------------|-------------|----------------|--------------|--------------|-------------|---------------|-------------|-------------|-----------|-----------|--------------|
| =====          | =====        | ===== | =====         | =====         | =====        | =====       | =====          | =====        | =====        | =====       | =====         | =====       | =====       | =====     | =====     | =====        |
| 32             | B203489      | 4     | 2 U           | 06 U          | 0022         | 2 U         | 005 U          | .005 U       | 33 2         | 1 U         | 01 U          | 05 U        | 025 U       | 1 U       | 004       | 015          |
| 33             | B203589      | 4     | 0405          | .5 U          | .002 U       | 1           | 002 U          | 004 U        | 44 8         | 1 U         | .02 U         | 02 U        | .0465       | 0821      | 0049      | 014          |
| 34             | B203689      | 2     | 2 U           | .06 U         | .01 U        | .2 U        | 005 U          | 005 U        | 41 4         | 1 U         | 01 U          | 05 U        | 025 U       | .1 U      | 005 U     | 013 U        |
| 35             | B203689      | 2     | 2 U           | 06 U          | 01 U         | 2 U         | 005 U          | 005 U        | 41 4         | 1 U         | 01 U          | 05 U        | .025 U      | 1 U       | 005 U     | 013 U        |
| 36             | B203789      | 2     | 2 U           | 06 U          | 0186         | 2 U         | 005 U          | 005 U        | 8 05         | 1 U         | 01 U          | 05 U        | 025 U       | 1 U       | .025 U    | 1 U          |
| 37             | B203789      | 3     | 2 UR          | 06 UR         | 01 UA        | 2 UV        | 005 UA         | 005 UR       | 7 33 V       | 1 UV        | 01 UR         | 05 UV       | .025 UV     | 1 UV      | 01 UA     | .1 UA        |
| 38             | B203789      | 4     | .03 U         | .5 U          | .0046        | 05 U        | 002 U          | 004 U        | 9 07         | 1 U         | 02 U          | 02 U        | 02 U        | 0336      | 0065      | 024          |
| 39             | B203889      | 2     | 2 UA          | 06 UV         | 0106 A       | 2 UA        | 005 UV         | 005 UV       | 5 UV         | 1 UV        | 01 UV         | 05 UV       | 025 UA      | 1 UV      | 005 UA    | 1 UV         |
| 40             | B203889      | 3     | 2 UR          | 06 UV         | 01 UV        | 2 UV        | 005 UA         | 005 UR       | 5 UA         | 1 UV        | .01 UV        | 05 UV       | .025 UV     | 1 UA      | 005 UA    | 1 UA         |

| Station Number | Date Sampled | Magnesium (Mg) | Manganese (Mn) | Mercury (Hg) | Molybdenum (Mo) | Nickel (Ni) | Potassium (K) | Selenium (Se) | Silver (Ag) | Sodium (Na) | Strontium (Sr) | Thallium (Tl) | Tin (Sn) | Vanadium (V) | Zinc (Zn) |
|----------------|--------------|----------------|----------------|--------------|-----------------|-------------|---------------|---------------|-------------|-------------|----------------|---------------|----------|--------------|-----------|
| =====          | =====        | =====          | =====          | =====        | =====           | =====       | =====         | =====         | =====       | =====       | =====          | =====         | =====    | =====        | =====     |
| 32             | B203489      | 12/18/89       | 5 15           | .015 U       | 0002 U          | .1 U        | 04 U          | 0345          | 01 U        | 42.4        | .205           | 003 U         | 1 U      | .05 U        | .02 U     |
| 33             | B203589      | 10/24/89       | 8.25           | 0143         | .0002 U         | .5 U        | 02 U          | 0628          | 03 U        | 22 4        | 267            | 003 U         | 1 U      | .01 U        | .0162     |
| 34             | B203689      | 05/25/89       | 6.72           | .07          | .0008           | .015 U      | 04 U          | 005 U         | 01 U        | 19 8        | 1 U            | 01            | 1 U      | .05 U        | .02 U     |
| 35             | B203689      | 05/25/89       | 6 72           | 07           | .0008           | .015        | 04 U          | 005 U         | 01 U        | 19 8        | 1 U            | 01 U          | 1 U      | .05 U        | .02       |
| 36             | B203789      | 06/27/89       | 5 U            | 015 U        | 0002 U          | .1 U        | 04 U          | 0076          | 01 U        | 64 8        | 1              | 01 U          | 1 U      | .05 U        | .02 U     |
| 37             | B203789      | 08/29/89       | 5 UV           | 015 UV       | 0003 A          | 1 UA        | 04 UR         | 005 UR        | 01 UA       | 61 7 V      | 1 UA           | 01 UV         | 1 UA     | .05 U        | .02 UA    |
| 38             | B203789      | 11/27/89       | 1 91           | 01 U         | 0002 U          | 5 U         | 02 U          | 002 U         | 03 U        | 68 9        | 139            | 015 U         | 1 U      | .01 U        | .012      |
| 39             | B203889      | 06/28/89       | 5 UV           | 015 UV       | .0002 UV        | .112 V      | .04 UR        | 041 V         | 01 UV       | 71 3 V      | 1 UV           | 01 UV         | .1 UV    | .05 U        | .0389 A   |
| 40             | B203889      | 08/28/89       | 5 UV           | 015 UV       | .0003 A         | 1 UA        | 04 UV         | 0127 V        | 01 UA       | 65 7 V      | 1 UA           | 01 UV         | .1 UA    | .05 U        | .02 UA    |

U=Analyzed but not detected J=Present below detection limit E=Estimated value =Missing  
A=Acceptable with qualifications V=Valid and acceptable R=Rejected qtr=Quarter

Dissolved Metal Concentrations for 1989 Background Ground Water Stations  
(Concentration units mg/L)

page 5

| Station Number | Date Sampled     | Aluminum (Al) | Antimony (Sb) | Arsenic (As) | Barium (Ba) | Beryllium (Be) | Cadmium (Cd) | Calcium (Ca) | Cesium (Cs) | Chromium (Cr) | Cobalt (Co) | Copper (Cu) | Iron (Fe) | Lead (Pb) | Lithium (Li) |
|----------------|------------------|---------------|---------------|--------------|-------------|----------------|--------------|--------------|-------------|---------------|-------------|-------------|-----------|-----------|--------------|
| =====          | =====            | =====         | =====         | =====        | =====       | =====          | =====        | =====        | =====       | =====         | =====       | =====       | =====     | =====     | =====        |
| 41             | 8203989 06/16/89 | 2             | .06 UV        | .01 UV       | 2 UV        | .005 UR        | .005 UA      | 12.8 V       | 1 UV        | 01 UR         | 05 UV       | .025 UV     | 1 UA      | 025 UA    | .1 UV        |
| 42             | 8203989 08/18/89 | 3             | .06 UV        | .01 UV       | .2 UV       | .005 UV        | .005 UV      | 13.5 V       | 1 UV        | 01 UR         | 05 UV       | .025 UV     | 1 UV      | .003 UV   | 1 UV         |
| 43             | 8203989 11/10/89 | 4             | 06 UV         | .01 UV       | .2 U        | .005 UR        | .005 UV      | 11.2         | 1 UV        | 01 UV         | 05 UV       | .025 UV     | 1 UV      | 005 UA    | 1 UA         |
| 44             | 8204089 07/06/89 | 3             | .327 A        | 01 UA        | 2 UV        | .005 UV        | .005 UV      | 32.9 V       | 1 UV        | 01 UA         | 05 UV       | 025 UR      | 1 UR      | 005 UA    | 1 UV         |
| 45             | 8204089 10/13/89 | 4             | .2 U          | 01 U         | 2 U         | .005 U         | .005 U       | 41           | 1 U         | 01 U          | 05 U        | 025 U       | 1 U       | 005 U     | 1 U          |
| 46             | 8204189 06/27/89 | 2             | .2 U          | 01 U         | 2 U         | .005 U         | .005 U       | 39.6         | 1 U         | 01 U          | .05 U       | .025 U      | 1 U       | 025 U     | 1 U          |
| 47             | 8204189 08/24/89 | 3             | .2 UR         | 01 UV        | .2 UV       | .005 UA        | .005 UR      | 47.4 A       | 1 UV        | 01 UV         | .05 UV      | .025 UV     | 1 UA      | 02 UA     | .1 UA        |
| 48             | 8204189 10/12/89 | 4             | .2 UA         | 01 UA        | .2 UV       | .005 UV        | .005 UV      | 76.2 V       | 2.5 UV      | 01 UV         | 05 UV       | .025 UV     | 1 UV      | 024 A     | 104 A        |
| 49             | 8205589 07/21/89 | 3             | .2 UA         | 01 UR        | .2 UA       | .005 UV        | .005 UV      | 122 V        | 1 UV        | 01 UA         | 05 UV       | 025 UA      | 1 UR      | 005 UA    | 145 V        |
| 50             | 8205589 10/25/89 | 4             | .0403         | 002          | 0703        | .002 U         | .0051        | 117          | 1 U         | 02 U          | 02 U        | .02 U       | .054      | 0071      | 19           |

| Station Number | Date Sampled     | Magnesium (Mg) | Manganese (Mn) | Mercury (Hg) | Molybdenum (Mo) | Nickel (Ni) | Potassium (K) | Selenium (Se) | Silver (Ag) | Sodium (Na) | Strontium (Sr) | Thallium (Tl) | Tin (Sn) | Vanadium (V) | Zinc (Zn) |
|----------------|------------------|----------------|----------------|--------------|-----------------|-------------|---------------|---------------|-------------|-------------|----------------|---------------|----------|--------------|-----------|
| =====          | =====            | =====          | =====          | =====        | =====           | =====       | =====         | =====         | =====       | =====       | =====          | =====         | =====    | =====        | =====     |
| 41             | 8203989 06/16/89 | 5 UV           | .015 UR        | .0002 UV     | .1 UV           | 04 UA       | 5 UA          | .005 UV       | 01 UA       | 67.8 V      | 1 UV           | 04 UA         | .1 UV    | 05 U         | 374 V     |
| 42             | 8203989 08/18/89 | 5 UV           | .015 UA        | .0002 UV     | .1 UV           | 04 UR       | 5 UA          | .005 UV       | 01 UV       | 71.1 V      | 1 UV           | 01 UV         | .1 UV    | 05 U         | 02 UR     |
| 43             | 8203989 11/10/89 | 5 UV           | .015 UA        | .0002 UR     | .1 UV           | 04 UA       | 5 UA          | .005 UV       | .01 UV      | 68          | 1 UA           | .01 UV        | 1 UV     | 05 U         | 02 UR     |
| 44             | 8204089 07/06/89 | 5 UV           | .015 UV        | .0002 UV     | 1 UV            | .04 UA      | 21.9 V        | .017 V        | .01 UR      | 199 V       | 1 UV           | 04 UR         | 1 UV     | 05 U         | 0468 V    |
| 45             | 8204089 10/13/89 | 8.53           | .0445          | .0002 U      | 1 U             | 04 U        | 9.38          | .0053         | 01 U        | 207         | 1 U            | 01 U          | .1 U     | 05 U         | 02 U      |
| 46             | 8204189 06/27/89 | 5 U            | .015 U         | .0002 U      | 1 U             | 04 U        | 5.2           | .005 U        | .01 U       | 454         | 1 U            | 01 U          | 1 U      | 05 U         | 02 U      |
| 47             | 8204189 08/24/89 | 5.32 V         | .015 UV        | .0003 A      | .1 UA           | .04 UV      | 5 UA          | .005 UA       | .01 UA      | 342 V       | 1 UA           | 01 UV         | 1 UA     | 05 U         | 02 UA     |
| 48             | 8204189 10/12/89 | 10.1 V         | .015 UA        | .0002 UV     | 1 UV            | 04 UV       | 5 UA          | .005 UA       | 01 UV       | 415 V       | 1.03 A         | 01 UA         | 1 UV     | 05 U         | 0284 A    |
| 49             | 8205589 07/21/89 | 27.2 V         | .0296 V        | .0002 UV     | 1 UV            | .04 UA      | 5 UA          | .005 UA       | .01 UR      | 145 V       | 1 UV           | 02 UR         | 1 UV     | 05 U         | 0212 V    |
| 50             | 8205589 10/25/89 | 27.3           | .039           | .0002 U      | 5 U             | 02 U        | 1.73          | .0067         | .03 U       | 151         | 915            | .003 U        | 1 U      | 01 U         | 0145      |

U=Analyzed but not detected J=Present below detection limit E=Estimated value  
A=Acceptable with qualifications V=Valid and acceptable R=Rejected Qtr=Quarter

Dissolved Metal Concentrations for 1989 Background Ground Water Stations  
(Concentration units mg/L)

page 6

| Station Number | Date Sampled     | Aluminum (Al) | Antimony (Sb) | Arsenic (As) | Barium (Ba) | Beryllium (Be) | Cadmium (Cd) | Calcium (Ca) | Cesium (Cs) | Chromium (Cr) | Cobalt (Co) | Copper (Cu) | Iron (Fe) | Lead (Pb) | Lithium (Li) |
|----------------|------------------|---------------|---------------|--------------|-------------|----------------|--------------|--------------|-------------|---------------|-------------|-------------|-----------|-----------|--------------|
| 51             | B302089 07/25/89 | 3             | 06 UV         | .01 UA       | .2 UV       | 005 UV         | 005 UV       | 42 V         | 1 UV        | .01 UV        | .05 UV      | 025 UA      | .1 UA     | .005 UR   | 1 UV         |
| 52             | B302789 04/26/89 | 2             | .06 UV        | 01 UA        | 2 UV        | .005 UA        | .005 UV      | 68 1 V       | 1 UR        | 01 UV         | 05 UV       | 025 UR      | 1 UA      | .005 UA   | 0126 V       |
| 53             | B302889 04/27/89 | 2             | 06 UA         | 01 UV        | 2 UV        | 005 UA         | 005 UA       | 76 7 V       | 1 UR        | .01 UV        | 05 UV       | 025 UA      | .1 UA     | 005 UA    | .0164 V      |
| 54             | B302889 07/18/89 | 3             | .06 UV        | 01 UA        | 222 V       | .005 UV        | 005 UV       | 113 V        | 1 UV        | 01 UV         | 05 UV       | 025 UR      | 1 UA      | 005 UA    | 1 UV         |
| 55             | B302989 04/27/89 | 2             | 06 UV         | 01 UV        | 2 UV        | 005 UA         | 005 UR       | 70 2 V       | 1 UR        | 01 UV         | 05 UV       | 025 UR      | 1 UA      | 005 UA    | 0223 V       |
| 56             | B302989 07/19/89 | 3             | 06 UV         | 01 UA        | 2 UV        | 005 UV         | .005 UV      | 89 3 V       | 1 UV        | .01 UV        | 05 UV       | 025 UR      | 1 UA      | 005 UA    | 1 UV         |
| 57             | B302989 10/24/89 | 4             | .5 U          | 002 U        | 107         | 002 U          | 004 U        | 102          | 1 U         | 02 U          | .02 U       | 0266        | 0463      | .0028     | 039          |
| 58             | B304289 06/23/89 | 2             | 2 U           | .01 U        | 2 U         | 005 U          | 005 U        | 10.8         | 1 U         | .01 U         | 05 U        | 025 U       | 1 U       | 005 U     | 1 U          |
| 59             | B304289 08/22/89 | 3             | 2 UV          | 01 UV        | 2 UV        | 005 UV         | 005 UV       | 11 2 V       | 1 UV        | 01 UR         | 05 UV       | 025 UV      | 1 UV      | 003 UV    | 1 UV         |
| 60             | B304289 10/11/89 | 4             | 03 UR         | 002 UV       | 0851 V      | .002 UA        | 004 UV       | 11 3 V       | 1 UV        | 02 UV         | 02 UV       | 0695 A      | 0539 A    | 002 UA    | 043 V        |

| Station Number | Date Sampled     | Magnesium (Mg) | Manganese (Mn) | Mercury (Hg) | Molybdenum (Mo) | Nickel (Ni) | Potassium (K) | Selenium (Se) | Silver (Ag) | Sodium (Na) | Strontium (Sr) | Thallium (Tl) | Tin (Sn) | Vanadium (V) | Zinc (Zn) |
|----------------|------------------|----------------|----------------|--------------|-----------------|-------------|---------------|---------------|-------------|-------------|----------------|---------------|----------|--------------|-----------|
| 51             | B302089 07/25/89 | 13 9 V         | 015 UV         | 0002 UA      | 1 UV            | .04 UV      | 5 UA          | 0084 A        | 01 UV       | 143 V       | 409 A          | 01 UV         | 1 UV     | 05 U         | 0757 V    |
| 52             | B302789 04/26/89 | 11 8 V         | 015 UA         | .0002 UR     | .01 UV          | 04 UV       | 5 UA          | 005 UR        | 01 UV       | 31 4 V      | 1 UV           | 04 UA         | 1 UV     | 05 U         | 02 UA     |
| 53             | B302889 04/27/89 | 13 8 V         | 015 UV         | 0002 UV      | 01 UV           | .04 UR      | 5 UA          | 005 UR        | 01 UV       | 37 3 V      | 1 UV           | .04 UA        | 1 UV     | 05 U         | 02 UA     |
| 54             | B302889 07/18/89 | 18 1 V         | 0369 V         | 0002 UV      | .1 UV           | .04 UV      | 5 UR          | 005 UA        | 01 UR       | 42 3 V      | 1 UV           | 04 UA         | 1 UV     | 05 U         | 02 UA     |
| 55             | B302989 04/27/89 | 16 6 V         | .0546 V        | 0002 UV      | .01 UV          | 04 UV       | 5 UA          | 0114 A        | .01 UV      | 74 7 V      | 1 UV           | 04 UA         | .1 UV    | 05 U         | 02 UA     |
| 56             | B302989 07/19/89 | 22 2 V         | 0464 V         | 0002 UV      | .1 UV           | .04 UV      | 5 UR          | 005 UR        | 01 UR       | 60 6 V      | 1 UV           | .04 UA        | 1 UV     | 05 U         | 02 UA     |
| 57             | B302989 10/24/89 | 25 3           | 0173           | 0002 U       | .5 U            | 02 U        | 2 05          | 0258          | 03 U        | 66 4        | 8              | 003 U         | 1 U      | 01 U         | 0162      |
| 58             | B304289 06/23/89 | 5 U            | 015 U          | 0002 U       | .1 U            | 04 U        | 5 U           | 005 U         | .01 U       | 138         | 451            | 01 U          | 1 U      | 05 U         | 0329      |
| 59             | B304289 08/22/89 | 5 UV           | 015 UA         | 0002 V       | .1 UV           | .04 UV      | 5 UA          | 005 UV        | 01 UV       | 145 V       | 1 UV           | .01 UA        | 1 UV     | 05 U         | 02 UR     |
| 60             | B304289 10/11/89 | 2 65 V         | 0242 V         | 0002 UV      | 5 UV            | 02 UA       | 3 4 V         | 002 UV        | 03 UV       | 137 V       | 416 V          | 003 UA        | 1 UA     | 01 U         | .0338 A   |

U=Analyzed but not detected J=Present below detection limit E=Estimated value =Missing  
A=Acceptable with qualifications V=Valid and acceptable R=Rejected qtr=Quarter

Dissolved Metal Concentrations for 1989 Background Ground Water Stations  
(Concentration units mg/L)

page 7

| Station Number | Date Sampled | Aluminum (Al) | Antimony (Sb) | Arsenic (As) | Barium (Ba) | Beryllium (Be) | Cadmium (Cd) | Calcium (Ca) | Cesium (Cs) | Chromium (Cr) | Cobalt (Co) | Copper (Cu) | Iron (Fe) | Lead (Pb) | Lithium (Li) |
|----------------|--------------|---------------|---------------|--------------|-------------|----------------|--------------|--------------|-------------|---------------|-------------|-------------|-----------|-----------|--------------|
| 61             | 8304289      | 03 UR         | .5 UA         | 002 UV       | 0836 V      | .002 UA        | .004 UV      | 11.2 V       | 1 UV        | 02 UV         | 02 UV       | 0367 A      | .0412 A   | .002 UA   | 043 V        |
| 62             | 8304889      | 2 UA          | .06 UV        | 01 UA        | .2 UV       | .005 UV        | .005 UV      | 167 V        | 1 UV        | 01 UV         | .05 UV      | .025 UA     | .1 UV     | 003 UV    | 275 V        |
| 63             | 8304989      | .2 U          | .06 U         | 01 U         | .2 U        | .005 U         | 005 U        | 20.7         | 1 U         | 01 U          | .05 U       | 025 U       | 1 U       | 005 U     | 1 U          |
| 64             | 8304989      | .2 U          | 06 U          | .01 U        | 2 U         | 005 U          | 005 U        | 19.1         | 1 U         | 01 U          | 05 U        | .025 U      | 1 U       | 005 U     | 1 U          |
| 65             | 8305389      | 2 UA          | 06 UV         | .01 UV       | 2 UV        | .005 UA        | 005 UA       | 73.4 V       | 1 UV        | 01 UA         | .05 UV      | 025 UV      | 1 UA      | .005 UR   | .0381 V      |
| 66             | 8305389      | 2 UA          | 06 UV         | 01 UV        | 2 UV        | .005 UV        | .005 UV      | 66.6 V       | 1 UV        | 01 UV         | .05 UV      | .025 UV     | 1 UV      | 003 UV    | .1 UV        |
| 67             | 8305389      | 2 UA          | 06 UV         | 01 UV        | .2 UV       | 005 UV         | .005 UV      | 68.3 V       | 2.5 UV      | 01 UV         | 05 UV       | 025 UV      | 1 UV      | 003 UA    | 1 UV         |
| 68             | 8400189      | 2 U           | 06 U          | 01 U         | 2 U         | .005 U         | 005 U        | 18.6         | 1 U         | 01 U          | 05 U        | 025 U       | 1 U       | 005 U     | 1 U          |
| 69             | 8400189      | 2 U           | 06 U          | .01 U        | 2 U         | 005 U          | .005 U       | 17           | 1 U         | 01 U          | 05 U        | 025 U       | 1 U       | 005 U     | 1 U          |

| Station Number | Date Sampled | Magnesium (Mg) | Manganese (Mn) | Mercury (Hg) | Molybdenum (Mo) | Nickel (Ni) | Potassium (K) | Selenium (Se) | Silver (Ag) | Sodium (Na) | Strontium (Sr) | Thallium (Tl) | Tin (Sn) | Vanadium (V) | Zinc (Zn) |
|----------------|--------------|----------------|----------------|--------------|-----------------|-------------|---------------|---------------|-------------|-------------|----------------|---------------|----------|--------------|-----------|
| 61             | 8304289      | 2.55 V         | .0223 V        | .0002 UV     | .5 UV           | 02 UV       | 3.41 V        | 002 UA        | .03 UV      | 138 V       | 403 V          | 003 UA        | 1 UA     | .01 U        | 0407 A    |
| 62             | 8304889      | 45.7 V         | .846 V         | .0002 UV     | .1 UV           | 04 UR       | 5.31 A        | 005 UV        | .01 UV      | 245 V       | 1.16 V         | 01 UV         | 1 UV     | 05 U         | 02 UA     |
| 63             | 8304989      | 5 U            | 0182           | 0002 U       | 1 U             | .04 U       | 12.3          | 005 U         | .01 U       | 168         | 446            | 01 U          | 1 U      | 05 U         | 0299      |
| 64             | 8304989      | 5 U            | 0673           | .0002 U      | .1 U            | 04 U        | 8.61          | 005 U         | 01 U        | 186         | 1 U            | 01 U          | 1 U      | 05 U         | 02 U      |
| 65             | 8305389      | 15.7 V         | 0526 V         | .0002 UV     | .0113 A         | 04 UA       | 5 UA          | 005 UR        | .01 UA      | 36.9 V      | 1 UA           | 05 UA         | 1 UA     | 05 U         | 02 UR     |
| 66             | 8305389      | 17.4 V         | 0361 A         | .0002 UV     | .1 UV           | 04 UR       | 5 UA          | 005 UV        | 01 UV       | 44.7 V      | 1 UV           | 01 UV         | 1 UV     | 05 U         | 02 UR     |
| 67             | 8305389      | 16 V           | 015 UA         | 0002 UV      | .1 UV           | 04 UV       | 5 UV          | 005 UV        | 01 UV       | 36.1 V      | 581 A          | 01 UA         | 1 UV     | 05 U         | 0527 A    |
| 68             | 8400189      | 5 U            | 151            | 0002 U       | 1 U             | 04 U        | 5 U           | 005 U         | 01 U        | 6.89        | 1 U            | 01 U          | 1 U      | 05 U         | 02 U      |
| 69             | 8400189      | 5 U            | .0171          | .0002 U      | 1 U             | 04 U        | 5 U           | 005 U         | 01 U        | 6.33        | 1 U            | 01 U          | 1 U      | 05 U         | 02 U      |

U=Analyzed but not detected J=Present below detection limit E=Estimated value =Missing  
A=Acceptable with qualifications V=Valid and acceptable R=Rejected Qtr=Quarter

Dissolved Metal Concentrations for 1989 Background Ground Water Stations  
(Concentration units mg/l)

page 8

| Station Number | Date Sampled | Aluminum (Al) | Antimony (Sb) | Arsenic (As) | Barium (Ba) | Beryllium (Be) | Cadmium (Cd) | Calcium (Ca) | Cesium (Cs) | Chromium (Cr) | Cobalt (Co) | Copper (Cu) | Iron (Fe) | Lead (Pb) | Lithium (Li) |
|----------------|--------------|---------------|---------------|--------------|-------------|----------------|--------------|--------------|-------------|---------------|-------------|-------------|-----------|-----------|--------------|
| 70             | 8400289      | 06/15/89      | 2             | 2 UR         | 06 UA       | 01 UA          | 01 UA        | 22 V         | 1 UV        | 01 UR         | .05 UV      | 025 UV      | 1 UA      | 005 UA    | 1 UA         |
| 71             | 8400289      | 11/01/89      | 4             | 2 U          | 06 U        | 01 U           | 005 U        | 17 2         | 1 U         | .01 U         | 05 U        | 025 U       | 1 U       | 005 U     | 1 U          |
| 72             | 8400389      | 06/16/89      | 2             | 2 UR         | 06 UV       | 01 UR          | 005 UR       | 71 4 V       | 1 UV        | 01 UR         | 05 UV       | 025 UV      | 1 UA      | 005 UV    | 1 UV         |
| 73             | 8400389      | 08/15/89      | 3             | 2 UA         | .06 UV      | 01 UR          | 005 UV       | 72 V         | 1 UV        | .01 UV        | 05 UV       | 025 UV      | .1 UV     | 003 UA    | 1 UV         |
| 74             | 8400389      | 11/02/89      | 4             | 0403         | 5 U         | 002 U          | 002 U        | 70 1         | 1 U         | 02 U          | .02 U       | 02 U        | 12        | 002 U     | 008          |
| 75             | 8400489      | 06/15/89      | 2             | 2 UR         | 06 UA       | 01 UR          | 005 UR       | 47 V         | 1 UV        | 01 UV         | 05 UV       | 025 UV      | .1 UV     | .005 UA   | 1 UA         |
| 76             | 8400489      | 08/17/89      | 3             | 2 UV         | 06 UV       | 01 UV          | 005 UV       | 45 6 V       | 1 UV        | 01 UR         | 05 UV       | 025 UA      | .1 UV     | 003 UV    | 1 UV         |
| 77             | 8401989      | 05/04/89      | 2             | 2 U          | 06 U        | 01 U           | 005 U        | 63           | 1 U         | 01 U          | 05 U        | 025 U       | 1 U       | 005 U     | .01 U        |
| 78             | 8401989      | 05/04/89      | 2             | 2 U          | 06 U        | 01 U           | 005 U        | 65 6         | 1 U         | 01 U          | 05 U        | 025 U       | 1 U       | 025 U     | 01 U         |
| 79             | 8401989      | 07/24/89      | 3             | 2 UA         | 06 UV       | 01 UV          | 005 UV       | 69 5 V       | 1 UV        | 01 UA         | 05 UV       | 025 UR      | .1 UR     | 005 UA    | .1 UV        |
| 80             | 8401989      | 10/10/89      | 4             | 2 U          | 06 U        | 01 U           | 005 U        | 80.1         | 2 5 U       | 01 U          | .05 U       | 025 U       | .1 U      | 003 U     | .1 U         |

| Station Number | Date Sampled | Magnesium (Mg) | Manganese (Mn) | Mercury (Hg) | Molybdenum (Mo) | Nickel (Ni) | Potassium (K) | Selenium (Se) | Silver (Ag) | Sodium (Na) | Strontium (Sr) | Thallium (Tl) | Tin (Sn) | Vanadium (V) | Zinc (Zn) |
|----------------|--------------|----------------|----------------|--------------|-----------------|-------------|---------------|---------------|-------------|-------------|----------------|---------------|----------|--------------|-----------|
| 70             | 8400289      | 06/15/89       | 5 UV           | 257 A        | 0002 UR         | 1 UA        | 5 UA          | 005 UV        | 01 UA       | 7 77 V      | 1 UA           | 01 UA         | 1 UA     | 05 U         | 02 UR     |
| 71             | 8400289      | 11/01/89       | 5 U            | 0787         | .0002 U         | 1 U         | 5 U           | 005 U         | 01 U        | 7 51        | 1 U            | 01 U          | 1 U      | 05 U         | 02 U      |
| 72             | 8400389      | 06/16/89       | 5 23 V         | .0847 A      | .0002 UV        | 1 UV        | 5 UR          | 005 UA        | 01 UA       | 5 UV        | 1 UV           | .04 UA        | 1 UV     | 05 U         | 02 UV     |
| 73             | 8400389      | 08/15/89       | 5.57 V         | .0574 V      | .0002 UV        | .1 UV       | 5 UV          | 005 UV        | 01 UA       | 6 38        | 1 UV           | 01 UR         | 1 UV     | .05 U        | 02 UA     |
| 74             | 8400389      | 11/02/89       | 5.17           | 01 U         | .0002 U         | .5 U        | 615           | 002 U         | 03 U        | 5 05        | 177            | .003 U        | 1 U      | 01 U         | 0162      |
| 75             | 8400489      | 06/15/89       | 5 UV           | 268 A        | .0002 UR        | 1 UA        | 5 UR          | 005 UA        | 01 UA       | 8 9 V       | 1 UA           | 04 UA         | 1 UA     | 05 U         | 02 UA     |
| 76             | 8400489      | 08/17/89       | 5 UV           | 263 V        | .0002 UV        | 1 UV        | 5 UA          | 005 UV        | 01 UV       | 10 1 V      | 1 UV           | 01 UV         | 1 UV     | 05 U         | 02 UR     |
| 77             | 8401989      | 05/04/89       | 10 1           | 015 U        | .0002 U         | .01 U       | 5 U           | 005 U         | 01 U        | 27 4        | 1 U            | 01 U          | 1 U      | 05 U         | 02 U      |
| 78             | 8401989      | 05/04/89       | 10 6           | 015 U        | .0002 U         | .01 U       | 5 U           | 005 U         | 01 U        | 28 1        | 1 U            | 04 U          | 1 U      | 05 U         | 02 U      |
| 79             | 8401989      | 07/24/89       | 10 8 V         | .015 UV      | .0002 UV        | 1 UV        | 5 UA          | 005 UR        | 01 UR       | 26 5 V      | 1 UV           | 01 UV         | 1 UV     | 05 U         | 02 UV     |
| 80             | 8401989      | 10/10/89       | 13 2           | 015 U        | .0002 U         | 1 U         | 5 U           | 005 U         | 01 U        | 33 1        | 417            | 01 U          | 1 U      | 05 U         | 0459      |

U=Analyzed but not detected J=Present below detection limit E=Estimated value  
A=Acceptable with qualifications V=Valid and acceptable R=Rejected Qtr=Quarter

Dissolved Metal Concentrations for 1989 Background Ground Water Stations  
(Concentration units mg/l)

page 9

| Station Number | Date Sampled | Aluminum (Al) | Antimony (Sb) | Arsenic (As) | Barium (Ba) | Beryllium (Be) | Cadmium (Cd) | Calcium (Ca) | Cesium (Cs) | Chromium (Cr) | Cobalt (Co) | Copper (Cu) | Iron (Fe) | Lead (Pb) | Lithium (Li) |
|----------------|--------------|---------------|---------------|--------------|-------------|----------------|--------------|--------------|-------------|---------------|-------------|-------------|-----------|-----------|--------------|
| 81             | 8402189      | 06/05/89      | 06 UV         | 01 UV        | 2 UV        | 005 UV         | .005 UA      | 65 7 V       | 1 UV        | 01 UA         | 05 UV       | .025 UV     | 1 UA      | 005 UA    | .0106 V      |
| 82             | 8402189      | 08/24/89      | 06 UR         | .01 UR       | 2 UV        | 005 UR         | .005 UV      | 49 4 V       | 1 UV        | .01 UV        | 05 UV       | .025 UV     | 1 UV      | 005 UV    | 1 UA         |
| 83             | 8402189      | 10/09/89      | 06 UV         | .01 UA       | 2 UV        | 005 UV         | .005 UV      | 59 7 V       | 2 5 UV      | .01 UV        | 05 UV       | 025 UA      | 1 UV      | 003 UR    | .1 UV        |
| 84             | 8402689      | 04/27/89      | 06 UA         | 01 UV        | 2 UV        | 005 UA         | .005 UR      | 103 V        | 1 UR        | 01 UV         | 05 UV       | 025 UA      | 1 UA      | 025 UA    | .0167 V      |
| 85             | 8405289      | 09/22/89      | 06 U          | 01 U         | .2 U        | 005 U          | 005 U        | 99 3         | 1 U         | 0177          | 05 U        | 025 U       | 1 U       | 005 U     | 283          |
| 86             | 8405489      | 06/21/89      | 06 U          | 01 U         | 2 U         | 005 U          | .005 U       | 41 6         | 1 U         | 01 U          | 05 U        | 025 U       | 1 U       | 005 U     | 1 U          |
| 87             | 8405489      | 08/25/89      | 06 UV         | 01 UV        | 2 UV        | 005 UA         | 005 UR       | 35 3 A       | 1 UV        | .01 UV        | 05 UV       | 025 UV      | 1 UA      | 005 UA    | 1 UA         |
| 88             | 8405489      | 11/08/89      | 06 U          | 01 U         | .2 U        | 005 U          | 005 U        | 38 6         | 2.5 U       | 01 U          | 05 U        | 025 U       | 1 U       | 003 U     | 1 U          |
| 89             | 8405586      | 01/05/89      | 05 U          | 001 U        | 0778 J      | 002 U          | 005 U        | 23 5674      | 005 U       | 009 U         | 029 U       | 004 U       | .0531 J   | 0016 J    |              |
| 90             | 8405586      | 06/08/89      | 06 UV         | 01 UA        | .2 UV       | 005 UA         | 005 UV       | 21 5 V       | 1 UV        | 01 UV         | 05 UV       | 025 UA      | 1 UA      | .005 UA   | 1 UA         |

| Station Number | Date Sampled | Magnesium (Mg) | Manganese (Mn) | Mercury (Hg) | Molybdenum (Mo) | Nickel (Ni) | Potassium (K) | Selenium (Se) | Silver (Ag) | Sodium (Na) | Strontium (Sr) | Thallium (Tl) | Tin (Sn) | Vanadium (V) | Zinc (Zn) |
|----------------|--------------|----------------|----------------|--------------|-----------------|-------------|---------------|---------------|-------------|-------------|----------------|---------------|----------|--------------|-----------|
| 81             | 8402189      | 06/05/89       | 292 V          | 0002 UV      | .015 A          | 04 UA       | 5 UA          | 005 UR        | .01 UA      | 25 6 V      | 1 UA           | 05 UA         | .1 UA    | 05 U         | 02 UV     |
| 82             | 8402189      | 08/24/89       | .271 V         | .0002 UV     | 1 UA            | 04 UV       | 5 UA          | 005 UR        | 01 UR       | 25 3 V      | 1 UA           | 01 UV         | 1 UA     | 05 U         | 02 UA     |
| 83             | 8402189      | 10/09/89       | .0306 A        | 0002 UR      | 1 UV            | 04 UV       | 5 UR          | 005 UA        | 01 UV       | 23 9 V      | 288 A          | 01 UA         | 1 UV     | 05 U         | 02 UA     |
| 84             | 8402689      | 04/27/89       | 686 V          | .0002 UR     | .01 UV          | 04 UR       | 5 UA          | 005 UR        | 01 UV       | 45 9 V      | 1 UV           | 04 UA         | 1 UV     | 05 U         | 0212 A    |
| 85             | 8405289      | 09/22/89       | 0774           | .0003        | 105             | 04 U        | 20 5          | 0058          | .01 U       | 105         | 1 43           | 04 U          | 1 U      |              | 0409      |
| 86             | 8405489      | 06/21/89       | .015 U         | 0002 U       | 1 U             | .04 U       | 5 U           | 005 U         | 01 U        | 15 7        | 1 U            | 01 U          | 1 U      | 05 U         | 107       |
| 87             | 8405489      | 08/25/89       | .015 UV        | 0003 A       | 1 UA            | 04 UV       | 5 UR          | 005 UA        | 01 UA       | 14 4 V      | 1 UA           | 01 UV         | 1 UA     | 05 U         | 0288 A    |
| 88             | 8405489      | 11/08/89       | .015 U         | 0002 U       | 1 U             | 04 U        | 5 U           | 005 U         | 01 U        | 13 4        | 198            | 01 U          | 1 U      | 05 U         | 0422      |
| 89             | 8405586      | 01/05/89       | 4.0442 J       | 0058 J       | 027 U           | .0234 J     | 7 J           | 001 U         | 004 U       | 10 0427     | 1172 J         | 001 U         |          | 034 U        | 0418      |
| 90             | 8405586      | 06/08/89       | 0231 V         | 0002 UV      | 1 UV            | 04 UV       | 7 73 A        | 005 UA        | 01 UV       | 11 V        | 115 A          | 01 UV         | 1 UV     | 05 U         | 0383 A    |

U=Analyzed but not detected J=Present below detection limit E=Estimated value =Missing  
A=Acceptable with qualifications V=Valid and acceptable R=Rejected qtr=Quarter

Dissolved Metal Concentrations for 1989 Background Ground Water Stations  
(Concentration units mg/l)

page 10

| Station Number | Date Sampled | Aluminum (Al) | Antimony (Sb) | Arsenic (As) | Barium (Ba) | Beryllium (Be) | Cadmium (Cd) | Calcium (Ca) | Cesium (Cs) | Chromium (Cr) | Cobalt (Co) | Copper (Cu) | Iron (Fe) | Lead (Pb) | Lithium (Li) |
|----------------|--------------|---------------|---------------|--------------|-------------|----------------|--------------|--------------|-------------|---------------|-------------|-------------|-----------|-----------|--------------|
| =====          | =====        | =====         | =====         | =====        | =====       | =====          | =====        | =====        | =====       | =====         | =====       | =====       | =====     | =====     | =====        |
| 91             | B405586      | 08/01/89      | 3             | 0186 J       | 05 U        | .0756 J        | 002 U        | 005 U        | 25.1959     | .0092 J       | .029 U      | 004 U       | 035 U     |           |              |
| 92             | B405586      | 08/28/89      | 3             | 2 UV         | .06 UR      | 01 UV          | 005 UR       | 005 UV       | 20 2 V      | 01 UV         | .05 UV      | 025 UV      | 1 UA      | 005 UV    | 1 UA         |
| 93             | B405586      | 11/10/89      | 4             | 2 UV         | .06 UA      | 01 UV          | .005 UR      | .005 UV      | 23 2        | .01 UV        | 05 UV       | 025 UR      | 1 UV      | 005 UA    | 1 UA         |
| 94             | B405689      | 06/15/89      | 2             | .2 UR        | 06 UA       | .01 UR         | 005 UR       | 005 UA       | 64.5 V      | 01 UR         | .05 UV      | 025 UV      | 1 UV      | .005 UA   | 1 UA         |
| 95             | B405689      | 10/25/89      | 4             | .03 U        | .5 U        | 002 U          | 004 U        | 75           | 1 U         | 02 U          | 02 U        | 02 U        | 0911      | 0054      | 004          |
| 96             | B405789      | 06/16/89      | 2             | 2 UR         | 06 UV       | 01 UR          | 005 UR       | 005 UA       | 30 9 V      | 01 UR         | 05 UV       | 025 UV      | 1 UV      | 005 UA    | 1 UV         |
| 97             | B405789      | 08/18/89      | 3             | .2 UV        | .06 UV      | .01 UV         | 005 UR       | .005 UV      | 32.7 V      | 01 UA         | 05 UV       | 025 UV      | 1 UV      | .003 UV   | 1 UV         |
| 98             | B405789      | 11/10/89      | 4             | 2 UA         | .06 UV      | 01 UV          | 005 UR       | 005 UV       | 31          | 01 UV         | 05 UV       | 025 UR      | 1 UV      | 005 UA    | 1 UA         |
| 99             | B405889      | 06/14/89      | 2             | .2 U         | 06 U        | 01 U           | 005 U        | .005 U       | 36 2        | 0122          | 05 U        | 025 U       | 1 U       | .005 U    | 1 U          |
| 100            | B405889      | 06/14/89      | 2             | .2 UV        | .176 A      | .01 UV         | 005 UA       | 005 UR       | 34 4 A      | .01 UR        | .05 UR      | 025 UR      | 1 UV      | 005 UA    | 1 79 V       |
| 101            | B405889      | 08/23/89      | 3             | .2 UV        | 06 UR       | 01 UR          | 005 UR       | 005 UV       | 30 9 V      | 01 UV         | 05 UV       | 025 UV      | 1 UV      | 005 UV    | 1 UA         |

| Station Number | Date Sampled | Magnesium (Mg) | Manganese (Mn) | Mercury (Hg) | Molybdenum (Mo) | Nickel (Ni) | Potassium (K) | Selenium (Se) | Silver (Ag) | Sodium (Na) | Strontium (Sr) | Thallium (Tl) | Tin (Sn) | Vanadium (V) | Zinc (Zn) |
|----------------|--------------|----------------|----------------|--------------|-----------------|-------------|---------------|---------------|-------------|-------------|----------------|---------------|----------|--------------|-----------|
| =====          | =====        | =====          | =====          | =====        | =====           | =====       | =====         | =====         | =====       | =====       | =====          | =====         | =====    | =====        | =====     |
| 91             | B405586      | 08/01/89       | 4.2501 J       | .0187        | .027 U          | .022 U      | .             | 004 U         | 10 2512     | 1234 J      |                |               |          | 034 U        | 0343      |
| 92             | B405586      | 08/28/89       | 5 UV           | .015 UV      | .1 UA           | 04 UV       | 5 UA          | 005 UA        | 01 UV       | 8 61 V      | 1 UA           | 01 UA         | 1 UA     | 05 U         | 02 UA     |
| 93             | B405586      | 11/10/89       | 5 UV           | 015 UA       | .0002 UR        | .1 UV       | 5 UA          | .005 UV       | 01 UV       | 8.22        | 1 UA           | 01 UV         | 1 UV     | 05 U         | 02 UR     |
| 94             | B405689      | 06/15/89       | 5.32 V         | .139 A       | .0002 UR        | 1 UA        | 5 UA          | 005 UV        | 01 UA       | 5 UV        | 1 UA           | 01 UA         | 1 UA     | 05 U         | 02 UR     |
| 95             | B405689      | 10/25/89       | 4 45           | 0576         | .0002 U         | .5 U        | 1 19          | 002 U         | 03 U        | 4 82        | 156            | 003 U         | 1 U      | 01 U         | 0158      |
| 96             | B405789      | 06/16/89       | 5 UV           | 015 UR       | .0002 UV        | .1 UV       | 5 UR          | 005 UV        | 01 UA       | 9 02 V      | 1 UV           | 04 UA         | 1 UV     | 05 U         | 02 UR     |
| 97             | B405789      | 08/18/89       | 5 UV           | 015 UA       | .0002 UV        | .1 UV       | 5 UA          | 005 UV        | 01 UV       | 8 85 V      | 1 UV           | 01 UA         | 1 UV     | 05 U         | 02 UR     |
| 98             | B405789      | 11/10/89       | 5 UV           | 015 UA       | .0002 UR        | 1 UV        | 5 UR          | 005 UV        | 01 UV       | 9 83        | 1 UA           | 01 UV         | 1 UV     | 05 U         | 0506 A    |
| 99             | B405889      | 06/14/89       | 6.05           | 0178         | .0002 U         | .1 U        | 5 U           | 005 U         | 01 U        | 13 7        | 1 U            | 01 U          | 1 U      | 05 U         | 02 U      |
| 100            | B405889      | 06/14/89       | 5 89 A         | 019 V        | .0002 UV        | .1 UV       | 10 2 A        | 005 UA        | 01 UA       | 21 2 V      | 2 03 V         | 01 UV         | 1 UV     | 05 U         | 02 UA     |
| 101            | B405889      | 08/23/89       | 5 25 V         | 015 UA       | .0002 UV        | 1 UA        | 5 UA          | 005 UA        | 01 UV       | 12 6 V      | 1 UA           | 01 UA         | 1 UA     | 05 U         | 0258 A    |

U=Analyzed but not detected J=Present below detection limit E=Estimated value =Missing  
A=Acceptable with qualifications V=Valid and acceptable R=Rejected Qtr=Quarter

Inorganic Concentrations for 1989 Background Ground Water Stations  
(Concentration units mg/L except pH)

page 1

| Station Number | Date Sampled | Qtr | Total Dissolved Solids, TDS | Chloride Cl | Nitrate/Nitrite as N | Sulfate SO <sub>4</sub> | Bicarbonate HCO <sub>3</sub> | Carbonate CO <sub>3</sub> | pH pH unit | Cyanide CN |
|----------------|--------------|-----|-----------------------------|-------------|----------------------|-------------------------|------------------------------|---------------------------|------------|------------|
| B102289        | 04/25/89     | 2   | 800 V                       | 3 UV        | 0.69 A               | 13 V                    | 110 V                        | 5 UV                      | 7          | 0.0025 UV  |
| B102289        | 07/13/89     | 3   | 330 V                       | 8 V         | 0.3 V                | 14 V                    | 110 V                        | 5 UV                      | 7          | 0.01 U     |
| B102289        | 10/13/89     | 4   | 140 A                       | 7 V         | 1.1 V                | 14 A                    | 110 A                        | 5 UA                      | 6.9        | .          |
| B102389        | 04/25/89     | 2   | 370 V                       | 6 V         | 0.05 UA              | 41 V                    | 230 V                        | 5 UV                      | 6.8        | 0.0025 UV  |
| B102389        | 07/14/89     | 3   | 270 V                       | 7 V         | 0.21 A               | 39 A                    | 210 V                        | 5 UV                      | 6.7        | 0.01 UV    |
| B102389        | 10/19/89     | 4   | 270 A                       | 8 V         | 3.1 V                | 38 V                    | 220 A                        | 5 UA                      | 7.1        |            |
| B200589        | 06/07/89     | 2   | 210 V                       | 3 V         | 2.1 A                | 10 A                    | 72 V                         | 5 UV                      | 6.6        | 0.0038     |
| B200589        | 07/31/89     | 3   | 580 A                       | 16 V        | 2.3 V                | 14 V                    | 77 V                         | 5 UV                      | 6.8        | 0.01 UV    |
| B200589        | 07/31/89     | 3   | 230 V                       | 11 V        | 2.4 V                | 16 V                    | 76 V                         | 5 UV                      | 6.8        | 0.01 UV    |
| B200589        | 11/06/89     | 4   | 96 A                        | 4 V         | 2.6 V                | 14 V                    | 73 A                         | 5 UA                      | 6.8        | 0.0025 U   |
| B200689        | 06/07/89     | 2   | 160 V                       | 4 V         | 2 A                  | 16 A                    | 100 V                        | 5 UV                      | 7          | 0.0025 U   |
| B200689        | 11/03/89     | 4   | 210 A                       | 4 V         | 2.1 V                | 20 A                    | 100 A                        | 5 UA                      | 7          | 0.0025 U   |
| B200789        | 06/06/89     | 2   | 210 V                       | 4 A         | 2 V                  | 21 V                    | 130 V                        | 5 UV                      | 7.7        | 0.0025 U   |
| B200789        | 07/31/89     | 3   | 180 V                       | 8 V         | 2.4 V                | 24 V                    | 110 V                        | 5 UV                      | 7.1        | 0.01 UV    |
| B200789        | 07/31/89     | 3   | 180 V                       | 8 V         | 2.3 V                | 22 V                    | 110 V                        | 5 UV                      | 7.1        | 0.01 UV    |
| B200789        | 10/11/89     | 4   | 150 A                       | 4 V         | 2.8 V                | 27 V                    | 110 V                        | 5 UV                      | 6.9        |            |
| B200789        | 10/11/89     | 4   | 160 A                       | 4 V         | 2.7 V                | 26 V                    | 110 V                        | 5 UV                      | 7          |            |
| B200889        | 06/05/89     | 2   | 280 V                       | 4 V         | 2.3 A                | 29 V                    | 140 V                        | 5 UV                      | 7.3        | 0.0025 UV  |
| B200889        | 07/27/89     | 3   | 230 A                       | 3.8 V       | 2.4 V                | 25 A                    | 140 V                        | 5 UV                      | 7.5        | 0.01 UV    |
| B200889        | 10/05/89     | 4   | 300 A                       | 5 V         | 2.5 V                | 25 A                    | 130 V                        | 5 UV                      | 7.3        |            |
| B200889        | 10/05/89     | 4   | 290 A                       | 5 V         | 2.5 V                | 24 A                    | 130 V                        | 5 UV                      | 7.3        |            |
| B201189        | 05/05/89     | 2   | 520 A                       | 11 A        | 0.05 UR              | 86 A                    | 470 V                        | 5 UV                      | 7.4        | 0.0025 U   |
| B201189        | 07/21/89     | 3   | 550 A                       | 11 A        | 0.05 UV              | 98 V                    | 490 V                        | 5 UV                      | 7.5        | 0.01 UV    |
| B201189        | 10/26/89     | 4   | 550 A                       | 12 V        | 0.05 UV              | 78 V                    | 460 A                        | 5 UA                      | 7.2        |            |
| B201289        | 07/28/89     | 3   |                             | 28          | 6.5 V                | 780                     | 190                          | 5 U                       | 7.5        | 0.01 U     |
| B201289        | 10/26/89     | 4   |                             |             |                      |                         |                              |                           |            | 0.0025 U   |

U=Analyzed but not detected J=Present below detection limit E=Estimated value =Missing  
A=Acceptable with qualifications V=Valid and acceptable R=Rejected Qtr=Quarter

Inorganic Concentrations for 1989 Background Ground Water Stations  
(Concentration units mg/l except pH)

page 2

| Station Number | Date Sampled | Qtr | Total Dissolved Solids, TDS | Chloride Cl | Nitrate/Nitrite as N | Sulfate SO <sub>4</sub> | Bicarbonate HCO <sub>3</sub> | Carbonate CO <sub>3</sub> | pH pH unit | Cyanide CN |
|----------------|--------------|-----|-----------------------------|-------------|----------------------|-------------------------|------------------------------|---------------------------|------------|------------|
| B202489        | 04/24/89     | 2   | 200 A                       | 8 4 V       | 0.05 UA              | 40 V                    | 180 V                        | 5 UV                      | 7.4        | 0.0025 UV  |
| B202489        | 04/24/89     | 2   | 220 A                       | 8 4 V       | 0.05 UA              | 32 V                    | 180 V                        | 5 UV                      | 7.5        | 0.0025 UV  |
| B202489        | 10/12/89     | 4   | 370 A                       | 10 V        | 0.05 UV              | 76 A                    | 220 A                        | 5 UA                      | 7          | 0.0025 U   |
| B202589        | 04/26/89     | 2   | 290 V                       | 8 V         | 0.05 UA              | 53 V                    | 180 V                        | 5 UV                      | 7.5        | 0.0025 UV  |
| B202589        | 07/14/89     | 3   | 340 V                       | 11 V        | 0.25 A               | 63 A                    | 230 V                        | 5 UV                      | 7.4        | 0.01 UV    |
| B202589        | 10/13/89     | 4   | 300 A                       | 9 V         | 0.44 V               | 84 A                    | 250 A                        | 5 UA                      | 7          |            |
| B203189        | 08/18/89     | 3   |                             |             |                      |                         |                              |                           |            | 0.01 U     |
| B203189        | 10/24/89     | 4   |                             |             |                      |                         |                              |                           |            | 0.0025 U   |
| B203289        | 06/20/89     | 2   | 270 V                       | 3 UV        | 0.1 V                | 28 V                    | 400 V                        | 5 UV                      | 8.2        | 0.0025 U   |
| B203289        | 08/07/89     | 3   | 260 A                       | 3 UV        | 0.1 V                | 36 A                    | 160 V                        | 5 UV                      | 6.8        | 0.01 U     |
| B203289        | 11/06/89     | 4   | 270 A                       | 3 UV        | 0.06 V               | 30 V                    | 270 A                        | 5 UA                      | 7.9        | 0.01 U     |
| B203489        | 12/18/89     | 4   | 320 A                       | 4 V         | 0.5                  | 100 V                   | 144 A                        | 5 UA                      | 7.9        |            |
| B203689        | 05/25/89     | 2   | 210 A                       | 3 UV        | 0.44 A               | 11 V                    | 200 V                        | 5 UV                      | 7.6        | 0.0025 U   |
| B203689        | 05/25/89     | 2   | 210 A                       | 3 UV        | 0.66 A               | 13 V                    | 200 V                        | 5 UV                      | 7.6        | 0.0025 U   |
| B203789        | 08/29/89     | 3   |                             |             |                      |                         |                              |                           |            | 0.01 UV    |
| B203789        | 09/06/89     | 3   | 260 A                       | 6.2 V       | 0.1 V                | 17 V                    | 220 V                        | 5 UV                      | 8.6        | 0.01 U     |
| B203789        | 11/27/89     | 4   | 240 A                       | 5 V         | 0.08 A               | 10 A                    | 240 V                        | 4.9 V                     | 8.6        |            |
| B203989        | 06/16/89     | 2   | 230 V                       | 6 A         | 0.06 V               | 5 UA                    | 210 V                        | 9 V                       | 8.7        | 0.0025 UV  |
| B203989        | 08/18/89     | 3   | 200 A                       | 5 A         | 0.25 V               | 5 UV                    | 140 V                        | 6 V                       | 8.6        | 0.01 UV    |
| B203989        | 11/10/89     | 4   | 240 A                       | 4 V         | 0.05 UV              | 5 UV                    | 210 A                        | 5 UA                      | 8.4        |            |
| B204089        | 10/13/89     | 4   |                             |             |                      |                         |                              |                           |            | 0.0038     |
| B204189        | 08/25/89     | 3   |                             |             |                      |                         |                              |                           |            | 0.01 U     |
| B204189        | 10/12/89     | 4   | 1550 A                      | 230 V       | 3.6 V                | 670 A                   | 390 A                        | 12 A                      | 8.7        | 0.0028     |
| B205589        | 07/21/89     | 3   | 950 A                       | 18 A        | 0.43 V               | 220 V                   | 640 V                        | 5 UV                      | 7.5        | 0.01 UV    |

U=Analyzed but not detected J=Present below detection limit E=Estimated value  
A=Acceptable with qualifications V=Valid and acceptable R=Rejected Qtr=Quarter

Inorganic Concentrations for 1989 Background Ground Water Stations  
(Concentration units mg/l except pH)

page 3

| Station Number | Date Sampled | Qtr | Total Dissolved Solids, TDS | Chloride Cl | Nitrate/Nitrite as N | Sulfate SO4 | Bicarbonate HCO3 | Carbonate CO3 | pH unit | Cyanide CN |
|----------------|--------------|-----|-----------------------------|-------------|----------------------|-------------|------------------|---------------|---------|------------|
| B205589        | 10/25/89     | 4   | 900 A                       | 21 V        | 0 31 V               | 260 V       | 680 A            | 5 UA          | 7 5     |            |
| B302789        | 04/26/89     | 2   | 360 V                       | 14 V        | 0 05 A               | 56 V        | 280 V            | 5 UV          | 7 4     | 0.0025 UV  |
| B302889        | 04/27/89     | 2   | 460 A                       | 21 A        | 0 05 UA              | 77 A        | 280 V            | 5 UV          | 7 5     | 0.0025 UV  |
| B302889        | 07/18/89     | 3   | 490                         | 24          | 0.05 U               | 100         | 430              | 5 U           | 7 4     | 0 01 UV    |
| B302989        | 04/27/89     | 2   | 470 A                       | 26 A        | 0 08 A               | 120 V       | 280 V            | 5 UV          | 8       | 0 0025 UV  |
| B302989        | 07/19/89     | 3   | 560                         | 29          | 0 05 U               | 140         | 380              | 5 U           | 7 6     | 0 01 UA    |
| B302989        | 07/19/89     | 3   | 560                         | 30          | 0 05 U               | 140         | 380              | 5 U           | 7 6     | 0 01 UA    |
| B302989        | 10/24/89     | 4   | 640 A                       | 39 V        | 1 2 V                | 170 A       | 420 A            | 5 UA          | 7 5     | .          |
| B303089        | 11/02/89     | 4   | 3300 A                      | 160 V       | 0 51 V               | 1800 V      | 540 A            | 5 UA          | 7 9     |            |
| B304289        | 06/23/89     | 2   | 420                         | 110         | 0 05 U               | 8           | 250              | 18            | 8 9     | 0 0025 U   |
| B304289        | 08/22/89     | 3   | 440 A                       | 110 A       | 0 05 UA              | 5 UV        | 240 A            | 25 A          | 8 8     | 0 01 UV    |
| B304289        | 10/11/89     | 4   | 430 A                       | 98 V        | 0 05 UV              | 9 V         | 260 V            | 7 V           | 8.4     | .          |
| B304289        | 10/11/89     | 4   | 430 A                       | 100 V       | 0 05 UV              | 8 V         | 290 V            | 7 V           | 8 4     |            |
| B304889        | 08/22/89     | 3   | .                           |             | 0 05 UA              |             | .                |               |         | 0 01 UV    |
| B304989        | 06/23/89     | 2   | 560                         | 200         | 0 05 U               | 5 U         | 270              | 6             | 8 5     | 0 0027 U   |
| B304989        | 08/23/89     | 3   | 660 A                       | 260 V       | .                    | 20 A        | 280 A            | 5 UA          | 8 4     | 0 01 U     |
| B305389        | 05/31/89     | 2   | 320 V                       | 11 V        | 0 18 V               | 44 A        | 260 V            | 5 UV          | 7 4     | 0 0025 UV  |
| B305389        | 08/22/89     | 3   | 370 A                       | 12 A        | 0.31 A               | 33 V        | 330 A            | 5 UA          | 7 6     | 0 01 UV    |
| B305389        | 10/12/89     | 4   | 320 A                       | 12 V        | 0.2 V                | 44 A        | 340 A            | 5 UA          | 7 3     | 0.0025 U   |
| B400189        | 06/14/89     | 2   | 170 A                       | 7 V         | 0 88 V               | 18 V        | 72 V             | 5 UV          | 7       | 0 0025 UV  |
| B400189        | 08/09/89     | 3   | 120 A                       | 3 UV        | 0 42 V               | 20 V        | 56 V             | 5 UV          | 6 7     | 0 01 UV    |
| B400189        | 10/31/89     | 4   | 150 A                       | 3 UV        | 0 24 V               | 16 V        | 69 A             | 5 UA          | 6 9     |            |
| B400289        | 06/15/89     | 2   | 150 A                       | 5 V         | 0.87 V               | 16 V        | 83 V             | 5 UV          | 7 2     | 0 0025 UV  |
| B400289        | 08/09/89     | 3   | 130 A                       | 3 UV        | 0 31 V               | 18 V        | 74 V             | 5 UV          | 6 7     | 0 01 UV    |

U=Analyzed but not detected J=Present below detection limit E=Estimated value  
A=Acceptable with qualifications V=Valid and acceptable R=Rejected Qtr=Quarter

Inorganic Concentrations for 1989 Background Ground Water Stations  
(Concentration units mg/l except pH)

page 4

| Station Number | Date Sampled | Qtr | Total Dissolved Solids, TDS | Chloride Cl | Nitrate/Nitrite as N | Sulfate SO4 | Bicarbonate HCO3 | Carbonate CO3 | pH Unit | Cyanide CN |
|----------------|--------------|-----|-----------------------------|-------------|----------------------|-------------|------------------|---------------|---------|------------|
| B400289        | 11/01/89     | 4   | 150 A                       | 3 UV        | 0.07 V               | 18 V        | 190 A            | 5 UA          | 6.8     |            |
| B400389        | 06/16/89     | 2   | 300 V                       | 8 A         | 1.2 V                | 39 V        | 450 V            | 5 UV          | 7.5     | 0.0025 UV  |
| B400389        | 08/15/89     | 3   | 270 A                       | 15 V        | 1.2 V                | 35 A        | 200 V            | 5 UV          | 7.4     | 0.01 UV    |
| B400389        | 11/02/89     | 4   | 240 A                       | 4 V         | 1.2 V                | 36 A        | 210 A            | 5 UA          | 7.5     | 0.0025 U   |
| B400489        | 06/15/89     | 2   | 220 A                       | 11 V        | 0.92 V               | 22 V        | 150 V            | 5 UV          | 7.9     | 0.0025 UV  |
| B400489        | 08/17/89     | 3   | 240 A                       | 11 A        | 0.81 V               | 22 V        | 130 V            | 5 UV          | 7.3     | 0.01 UV    |
| B401989        | 05/04/89     | 2   | 290 A                       | 20 A        | 0.18 R               | 45 A        | 230 V            | 5 UV          | 7.1     | 0.0025 U   |
| B401989        | 05/04/89     | 2   | 2900 A                      | 18 A        | 0.2 R                | 41 A        | 230 V            | 5 UV          | 7.1     | 0.0025 U   |
| B401989        | 07/24/89     | 3   | 420 A                       | 18 A        | 0.08 V               | 47 A        | 270 V            | 5 UV          | 7.2     | 0.01 UA    |
| B401989        | 10/10/89     | 4   | 360 A                       | 16 V        | 0.05 UV              | 41 A        | 320 A            | 5 UA          | 7.1     | 0.0025 U   |
| B402189        | 06/05/89     | 2   | 220 V                       | 15 V        | 0.18 A               | 48 V        | 230 V            | 5 UV          | 7.2     | 0.0025 UV  |
| B402189        | 08/24/89     | 3   | 170 A                       | 18 V        | 0.22 V               | 20 A        | 210 A            | 5 UA          | 7.3     | 0.01 U     |
| B402189        | 10/09/89     | 4   | 300 A                       | 15 V        | 0.27 V               | 39 V        | 240 V            | 5 UV          | 7.3     |            |
| B402189        | 10/09/89     | 4   |                             |             | .                    | .           |                  |               |         | 0.0025 U   |
| B402689        | 04/27/89     | 2   | 380 A                       | 19 A        | 0.05 UA              | 52 A        | 610 V            | 5 UV          | 7.6     | 0.0025 UV  |
| B405289        | 09/22/89     | 3   | 940                         | 6           | 2.3                  | 440         | 320              | 5 U           | 7.7     |            |
| B405489        | 06/21/89     | 2   | 220 V                       | 6 V         | 0.58 V               | 24 V        | 180 V            | 5 UV          | 7.5     | 0.0036 V   |
| B405489        | 08/25/89     | 3   | 190 A                       | 3 UV        | 0.43 V               | 22 A        | 170 A            | 5 UA          | 7.6     | 0.01 UV    |
| B405489        | 11/08/89     | 4   | 200 A                       | 26 V        | 0.42 V               | 21 A        | 180 A            | 5 UA          | 7.5     | 0.01 U     |
| B405586        | 01/05/89     | 1   | 135                         | 5.18        | 1.12                 | 15.8        | 65.8             |               |         |            |
| B405586        | 06/08/89     | 2   | 260 V                       | 5 A         | 1.3 V                | 26 V        | 86 V             | 5 UV          | 6.9     | 0.0035     |
| B405586        | 08/28/89     | 3   | 130 A                       | 7 V         | 1 V                  | 25 V        | 76 V             | 5 UV          | 6.7     | 0.01 UV    |
| B405586        | 11/10/89     | 4   | 150 A                       | 6 V         | 1.2 V                | 19 V        | 81 A             | 5 UA          | 6.9     |            |
| B405689        | 06/15/89     | 2   | 250 A                       | 4 V         | 0.66 V               | 32 V        | 200 V            | 5 UV          | 7.9     | 0.0025 UV  |
| B405689        | 08/21/89     | 3   | 270                         | 4           | 0.96                 | 35          | 220              | 5 U           | 7.4     | 0.01 UV    |

U=Analyzed but not detected J=Present below detection limit E=Estimated value  
A=Acceptable with qualifications V=Valid and acceptable R=Rejected qtr=Quarter

Inorganic Concentrations for 1989 Background Ground Water Stations  
(Concentration units mg/l except pH)

page 5

| Station Number | Date Sampled | Qtr | Total Dissolved Solids, TDS | Chloride Cl | Nitrate/Nitrite as N | Sulfate SO4 | Bicarbonate HCO3 | Carbonate CO3 | pH unit | Cyanide CN |
|----------------|--------------|-----|-----------------------------|-------------|----------------------|-------------|------------------|---------------|---------|------------|
| B405689        | 10/25/89     | 4   | 240 A                       | 4 V         | 1.2 V                | 34 V        | 230 A            | 5 UA          | 7.5     | .          |
| B405789        | 06/16/89     | 2   | 180 V                       | 14 A        | 1.2 V                | 16 V        | 100 V            | 5 UV          | 7.2     | 0 0025 UV  |
| B405789        | 08/18/89     | 3   | 180 A                       | 13 A        | 1.3 A                | 21 V        | 140 V            | 5 UV          | 7.2     | 0 01 UV    |
| B405789        | 11/10/89     | 4   | 170 A                       | 13 V        | 1.2 V                | 18 V        | 94 A             | 5 UA          | 7.2     |            |
| B405889        | 06/14/89     | 2   | 170 V                       | 6 A         | 1.6 V                | 16 V        | 140 V            | 5 UV          | 7.5     | 0 0025 U   |
| B405889        | 06/14/89     | 2   | 170 V                       | 6 A         | 1.4 V                | 16 V        | 140 V            | 5 UV          | 7.7     | 0 0025 U   |
| B405889        | 08/23/89     | 3   | 290 A                       | 6           | 1.4 V                | 13 A        | 130 A            | 5 UA          | 7.4     | 0 01 U     |
| B405889        | 10/18/89     | 4   | 170 A                       | 6 V         | 1.2 V                | 16 V        | 140 A            | 5 UA          | 7.2     |            |

U=Analyzed but not detected  
A=Acceptable with qualifications  
J=Present below detection limit  
V=Valid and acceptable  
E=Estimated value  
R=Rejected  
=Missing  
Qtr=Quarter

Total Radiochemical Concentrations for 1989 Background Ground Water Stations  
(Concentration units pCi/L)

page 1

| Station<br>Number | Date<br>Sampled | Gross<br>Alpha | Gross<br>Beta | Uranium<br>233,234 | Uranium<br>235 | Uranium<br>238 | Strontium<br>89,90 | Plutonium<br>239 | Americium<br>241 | Cesium<br>137 | Radium<br>226 | Radium<br>228 | Tritium |
|-------------------|-----------------|----------------|---------------|--------------------|----------------|----------------|--------------------|------------------|------------------|---------------|---------------|---------------|---------|
| B200889           | 07/27/89        | 3              | 4+4           | 3+3                |                |                |                    | 0+ 01            | 0+ 01            |               |               |               | 20+230  |
| B405586           | 08/01/89        | 3              | 6+ 5          | 1.6+2.4            |                |                |                    |                  |                  |               |               |               |         |

The table format is    concentration ± counting error    qtr=Quarter    =Missing data

Dissolved Radiochemical Concentrations for 1989 Background Ground Water Stations  
(Concentration units pCi/l)

page 1

| Station Number | Date Sampled | Qtr | Gross Alpha | Gross Beta | Uranium 233,234 | Uranium 235 | Uranium 238 | Strontium 89,90 | Plutonium 239 | Americium 241 | Cesium 137 | Radium 226 | Radium 228 | Iritium  |
|----------------|--------------|-----|-------------|------------|-----------------|-------------|-------------|-----------------|---------------|---------------|------------|------------|------------|----------|
| B102289        | 04/25/89     | 2   | 2+2         | 3+2        |                 | 0+ 1        | 2+ 2        | 1+ 4            | 0+ 01         | 0+ 01         | - 3+ 6     |            |            | 50+150   |
| B102289        | 07/13/89     | 3   | 2+2         | 2+2        |                 | 0+ 1        | 1+ 1        | 3+ 4            | 0+ 01         | 0+ 01         | 0+ 7       |            |            | -140+230 |
| B102289        | 10/13/89     | 4   | 3+ 5        | 1 4+1 6    |                 | 1+ 19       | 1+ 33       | - 02+ 37        | 003+ 004      |               | .06+ .47   |            |            | -200+220 |
| B102389        | 04/25/89     | 2   | 4+4         | 2+2        |                 | 0+ 1        | 2+ 2        | - 3+ 5          | 0+ 01         | 0+ 01         | 3+ 6       |            |            | 150+150  |
| B102389        | 07/14/89     | 3   | 4+5         | 4+3        |                 | 0+ 1        | 1+ 1        | - 2+ 4          | 03+ 01        | 0+ 01         | 0+ 5       |            |            | 100+220  |
| B102389        | 10/19/89     | 4   | 1 8+ 8      | 3 2+1 7    |                 | 34+ 39      | 45+ 45      | 29+ 39          | 007+ 005      |               | - 16+ 47   |            |            | 20+220   |
| B200589        | 06/07/89     | 2   | 1+2         | 2+2        |                 | 0+ 1        | 2+ 1        | - 7+1           | 0+ 01         | 0+ 01         | - 2+ 6     |            |            | 110+150  |
| B200589        | 07/31/89     | 3   | 2+2         | 1+2        |                 | 0+ 1        | 0+ 1        | 0+ 5            | 0+ 01         | 0+ 01         | 4+ 5       |            |            | 100+220  |
| B200589        | 07/31/89     | 3   | 1+3         | 3+2        |                 | 0+ 1        | 0+ 1        | - 1+ 5          | 0+ 01         | 01+ .01       | 1+ 6       |            |            | 20+220   |
| B200689        | 06/07/89     | 2   | 5+3         | 1+2        |                 | 0+ 1        | 1+ 1        | - 1+ 5          | 0+ 01         | 0+ 01         | - 1+ 7     | 1+ 5       |            | 140+150  |
| B200689        | 07/27/89     | 3   | -1+2        | 2+3        |                 | 0+ 1        | 0+ 1        | 0+ 2            | 0+ 01         | 0+ 01         | 1+ 5       | 170+240    |            |          |
| B200689        | 11/03/89     | 4   | 4+ 4        | 2 8+1 8    |                 | 23+ 26      | 69+ 46      | 39+ 36          | 006+ 004      |               | 0+ 41      |            |            | 250+190  |
| B200789        | 06/06/89     | 2   | 3+3         | 3+2        |                 | 0+ 1        | 1+ 1        | - 1+ 5          | 0+ 01         | 0+ 01         | - 1+ 5     |            |            | 250+220  |
| B200789        | 07/31/89     | 3   | 1+3         | 1+2        |                 | 0+ 1        | 1+ 1        | 0+ 5            | 0+ 01         | 0+ 01         | 0+ 4       |            |            | 220+220  |
| B200789        | 07/31/89     | 3   | 1+3         | 3+2        |                 | 0+ 1        | 1+ 1        | - 1+ 5          | 0+ 01         | 0+ 01         | 5+ 5       |            |            | 180+220  |
| B200789        | 10/11/89     | 4   | 7+ 6        | 2 1+1 8    |                 | 03+ 06      | 37+ 2       | 18+ 31          | 003+ 005      |               | 1+ 52      |            |            | -150+350 |
| B200789        | 10/11/89     | 4   | 1+ 6        | 1 3+1 6    |                 | - 08+ 29    | 08+ 37      | 03+ 3           | 004+ 003      |               | - 2+ 47    |            |            | -370+280 |
| B200889        | 06/05/89     | 2   | 12+8        | 7+5        |                 | 0+ 1        | 1+ 1        | - 1+ 6          | 01+ 01        | 0+ 02         | - 3+ 7     | 5+ 5       |            | 160+210  |
| B200889        | 07/27/89     | 3   | 4+4         | 3+3        |                 | 0+ 1        | 2+ 1        | 3+ 5            | 0+ 01         | 0+ 01         | 3+ 6       |            |            | 20+230   |
| B200889        | 10/05/89     | 4   | 4+ 6        | 2+1 6      |                 | 07+ 25      | 44+ 41      | 2 13+ 54        | 017+ 008      | 031+ 027      | 29+ 57     |            |            | 0+260    |
| B200889        | 10/05/89     | 4   | .6+ 5       | 2 8+1 7    |                 | 18+ 26      | 27+ 31      | 1 05+ 43        | 012+ 01       | 019+ 013      | 29+ 41     |            |            | -100+260 |
| B201189        | 05/05/89     | 2   | 27+12       | 12+5       |                 | 3+ 1        | 7 7+ 7      | 1+ 4            | 0+ 01         | - 01+ 01      | 2+ 6       | 4+ 2       |            | -100+140 |
| B201189        | 07/21/89     | 3   | 12+8        | 16+3       |                 | 5+ 2        | 9+ 8        | 0+ 4            | 0+ 01         | 0+ 01         | 3+ 5       | 5+ 3       |            | 120+230  |
| B201289        | 07/25/89     | 3   | 18+15       | 23+6       |                 | 3+ 2        | 5 7+ 8      | 0+ 5            | 0+ 01         | 0+ 01         | 1+ 5       | 8+ 4       |            | 0+200    |
| B201289        | 10/26/89     | 4   | 12 1+3 4    | 22 2+5 5   |                 | 36+ 16      | 5 87+ 81    | - 04+ 18        | 0+ 01         | 0+ 01         | - 2+ 47    |            |            | 0+190    |
| B202489        | 04/24/89     | 2   | 2+4         | 4+3        |                 | 0+ 1        | 8+ 2        | 3+ 5            | 01+ 01        | 0+ 01         | 2+ 6       |            |            | 190+150  |
| B202489        | 04/24/89     | 2   | 3+4         | 5+3        |                 | 1+ 1        | 6+ 2        | 6+ 5            | 0+ 01         | - 01+ 01      | - 1+ 5     |            |            | 170+150  |

The table format is: concentration + counting error Qtr=Quarter =Missing data

Dissolved Radiochemical Concentrations for 1989 Background Ground Water Stations  
(Concentration units pCi/l)

page 2

| Station Number | Date Sampled | Qtr | Gross Alpha | Gross Beta | Uranium 233,234 | Uranium 235 | Uranium 238 | Strontium 89,90 | Plutonium 239 | Americium 241 | Cesium 137 | Radium 226 | Radium 228 | Tritium  |
|----------------|--------------|-----|-------------|------------|-----------------|-------------|-------------|-----------------|---------------|---------------|------------|------------|------------|----------|
| B202489        | 08/21/89     | 3   |             |            |                 |             |             |                 |               |               |            |            |            | 140+220  |
| B202489        | 10/12/89     | 4   | 7+ 5        | 3+1 6      |                 | 16+ 33      | 49+ 57      | 1 03+ 76        | .008+ 006     |               | 0+ 45      |            |            | -20+230  |
| B202589        | 04/26/89     | 2   | 4+4         | 6+3        |                 | .1+ 1       | 1 2+ 3      | 5+ 5            | 0+ 01         | - 01+ 01      | 1+ 6       |            |            | 130+140  |
| B202589        | 07/14/89     | 3   | 3+5         | 5+3        |                 | 1+ 1        | 1+ 4        | 6+ 5            | 0+ 01         | 0+ 01         | 0+ 6       |            |            | 160+220  |
| B202589        | 10/13/89     | 4   | 2.7+1       | 5 2+2      |                 | 08+ 27      | 2 28+ 98    | 1 04+ 48        | 01+ 006       |               | - .1+ 48   |            |            | -340+210 |
| B203189        | 08/21/89     | 3   | 3+3         | 3+1        |                 | 0+ 1        | 8+ 2        | - 1+ 3          | 0+ 01         | 0+ 01         | - 1+ 5     |            |            | 40+220   |
| B203189        | 10/24/89     | 4   |             |            |                 |             |             |                 |               |               |            |            |            | -4+190   |
| B203189        | 11/16/89     | 4   | 11 5+1.4    | 5 8+2      |                 | 28+ 49      | 1 58+ 89    | 23+ 31          |               |               | 17+ 43     |            |            | 30+210   |
| B203289        | 06/20/89     | 2   | 12+4        | 6+2        |                 | 1+ 1        | 2 7+ 4      | 1+ 4            | 0+ 01         | 0+ 01         | 2+ 6       | 5+ 7       |            | -100+230 |
| B203289        | 08/16/89     | 3   | 8+6         | 3+5        |                 | 1+ 1        | 1 7+ 3      | - 3+ 4          | 0+ 01         | 0+ 01         | .3+ 6      |            |            | 140+200  |
| B203489        | 09/27/89     | 3   | 10 1+1 3    | 9 8+2 3    |                 | 12+ 17      | 4 68+1.06   | 08+ 17          | 011+ 007      | 034+ 025      | 2+ 84      | 29+ 09     |            | -60+220  |
| B203489        | 12/06/89     | 4   |             |            |                 | 27+ 27      | 2 29+ 81    |                 |               |               |            |            |            | 10+210   |
| B203489        | 12/18/89     | 4   |             |            |                 | 27+ 27      | 2 29+ 81    |                 |               |               |            |            |            | 10+210   |
| B203589        | 08/21/89     | 3   |             |            |                 |             |             |                 |               |               |            |            |            | 60+210   |
| B203589        | 10/26/89     | 4   | 3 1+ 8      | 2 2+1 9    |                 | 07+ 23      | 59+ 47      | 35+ 22          |               |               | - 07+ 45   |            |            | -50+210  |
| B203689        | 05/25/89     | 2   | 0+3         | 3+3        |                 | 0+ 1        | 4+ 2        | - 2+ 4          | 0+ 01         | 0+ 01         | 2+ 6       |            |            | 80+150   |
| B203689        | 05/25/89     | 2   | 0+3         | 3+3        |                 | 0+ 1        | 4+ 2        | - 1+ 3          | 0+ 01         | 0+ 01         | 1+ 5       |            |            | 30+150   |
| B203789        | 06/29/89     | 2   | 2+4         | 5+3        |                 | 0+ 1        | 7+ 2        | 1+ 4            | 0+ 01         | 0+ 01         | 3+ 4       |            |            | -110+220 |
| B203789        | 09/06/89     | 3   |             | 4+2        |                 | 1 7+2.2     | 5+ 9        | - 2+ 5          | 005+ 005      | .007+ .01     | - 04+ 14   |            |            | -600+300 |
| B203889        | 07/21/89     | 3   | 13+5        | 4+3        |                 | 1+ 1        | 1 5+ 3      | 2+ 3            | 0+ 01         | 0+ 01         | - 2+ 5     |            |            | -10+220  |
| B203889        | 08/28/89     | 3   | 5 6+1 1     | 7 8+2 2    |                 |             |             |                 |               |               |            |            |            | 10+210   |
| B203889        | 11/02/89     | 4   | 7 1+1 1     | 8 7+2.2    |                 | .37+ 43     | 1 48+ 85    | 1+ 46           | 004+ 004      |               | 19+ 44     |            |            | 330+160  |
| B203989        | 06/16/89     | 2   | 2+2         | 3+2        |                 | 1+ 1        | 1+ 1        | - 2+ 2          | 0+ 01         | 0+ 01         | .2+ 4      |            |            | 340+200  |
| B203989        | 08/18/89     | 3   | 1+4         | 2+3        |                 | 0+ 1        | - 1+ 1      | - 3+ 4          | 0+ 01         | 0+ 01         | - 3+ 5     |            |            |          |
| B204089        | 07/06/89     | 3   |             |            |                 | 0+ 1        | 0+ 1        | - 1+ 3          | 0+ 01         | 0+ 01         | 7+ 5       |            |            |          |

The table format is concentration + counting error qtr=Quarter =Missing data

Dissolved Radiochemical Concentrations for 1989 Background Ground Water Stations  
(Concentration units pCi/l)

page 3

| Station Number | Date Sampled | Qtr | Gross Alpha | Gross Beta | Uranium 233,234 | Uranium 235 | Uranium 238 | Strontium 89,90 | Plutonium 239 | Americium 241 | Cesium 137 | Radium 226 | Radium 228 | Tritium  |
|----------------|--------------|-----|-------------|------------|-----------------|-------------|-------------|-----------------|---------------|---------------|------------|------------|------------|----------|
| B204089        | 08/04/89     | 3   | 3+4         | 11+3       | .               | 0+ 1        | 1+ 1        | 5+ 5            | 01+ 01        | 02+ 03        | 3+ 5       |            |            | 30+220   |
| B204089        | 08/31/89     | 3   | 8 3+2.2     | 19.2+2.9   | .               | .07+ 14     | 91+ 51      | 29+ 3           | 007+ 006      | 082+ 027      | 06+ 91     |            |            | 30+220   |
| B204189        | 06/29/89     | 2   | -4+9        | 11+6       |                 | 0+ 1        | 6+ 2        | - 3+ 3          | 0+ 01         | 01+ 01        | - 1+ 5     |            |            | 100+230  |
| B204189        | 08/25/89     | 3   | 16+15       | 24+9       |                 | 0+ 1        | 6+ 2        | 0+ 3            | 0+ 01         | 0+ 01         | 0+ 6       | .2+ 3      |            | 20+220   |
| B204189        | 10/12/89     | 4   | 1.1+2.3     | 5.3+4      |                 | .12+ .23    | 12+ 7       | 46+ 44          | 004+ 009      |               | - 05+ 41   |            |            | -80+280  |
| B205589        | 07/21/89     | 3   | 200+40      | 220+10     |                 | 2 9+ 4      | 63+2        | - 2+ 4          | 0+ 01         | 0+ 01         | 4+ 5       | 2 8+ 5     |            | 90+220   |
| B205589        | 10/25/89     | 4   | 45+3.2      | 45.3+3.4   |                 | 7 74+1.5    | 76 9+4.7    | - 04+ 43        |               |               | 04+ 42     |            |            | -170+190 |
| B302789        | 04/26/89     | 2   | 3+6         | 5+3        |                 | 1+ 1        | 1 4+ 3      | 3+ 5            | 0+ 01         | 0+ 01         | - 5+ 8     |            |            | 130+140  |
| B302889        | 04/27/89     | 2   | 6+7         | 14+4       | .               | 1+ .1       | 2 6+ 5      | 1+ 5            | 0+ 01         | 0+ 01         | 1+ 6       | - 1+ 2     |            | 130+150  |
| B302989        | 04/27/89     | 2   | 10+9        | 5+4        |                 | 1+ 1        | 2 6+ 4      | 0+ 4            | 0+ 01         | - 01+ 01      | 0+ 6       | 2+ 2       |            | 50+150   |
| B302989        | 07/19/89     | 3   | 11+9        | 8+4        |                 | 1+ 1        | 3 2+ 4      | - 1+ 5          | 0+ 01         | 0+ 01         | 2+ 7       |            |            | 210+220  |
| B302989        | 07/19/89     | 3   | 6+8         | 7+4        |                 | 1+ 1        | 3 4+ 5      | 2+ 5            | 0+ 01         | 0+ 01         | 2+ 7       | 3+ 3       |            | 430+230  |
| B302989        | 10/24/89     | 4   | 4 3+1.3     | 6 2+2.2    | .               | 26+ .39     | 5 5+1.41    | 53+ 42          |               |               | - 09+ 4    |            |            | 40+220   |
| B304289        | 06/23/89     | 2   | 0+4         | 7+3        |                 | 0+ 1        | 1+ 1        | 2+ 4            | 0+ 01         | 0+ 01         | 2+ 5       | .          |            | -80+220  |
| B304289        | 08/23/89     | 3   | -1+5        | 7+3        | .               | 0+ 1        | 1+ 2        | 4+ 6            | 0+ 01         | 0+ 01         | - 2+ 6     |            |            | 0+220    |
| B304289        | 10/11/89     | 4   | 6+ 8        | 3 4+1.9    | .               | 14+ 28      | 84+ 8       | 35+ 29          | 009+ 008      |               | 26+ 44     |            |            | 230+280  |
| B304289        | 10/11/89     | 4   | 1.7+1       | 3+2        | .               | 09+ .13     | 84+ 4       | 26+ 32          | - 002+ 008    |               | 13+ 49     |            |            | -320+280 |
| B304889        | 08/22/89     | 3   |             |            | .               |             |             |                 |               |               |            |            |            | 40+220   |
| B304889        | 08/23/89     | 3   |             |            | .               |             |             |                 |               |               |            |            |            | 40+220   |
| B304989        | 06/23/89     | 2   | -2+4        | 15+4       | .               | 0+ 1        | 0+ 1        | 2+ 5            | 0+ 01         | 0+ 01         | 2+ 6       |            |            | -30+220  |
| B304989        | 08/23/89     | 3   | 6+11        | 8+5        | .               | 0+ 1        | 1+ 1        | 0+ 5            | 0+ 01         | 0+ 01         | - 2+ 5     | 6+ 2       |            | 30+240   |
| B304989        | 10/11/89     | 4   | 5 1+2.5     | 9 4+2.2    | .               | 1+ 19       | 19+ 27      | 42+ .31         | 006+ 005      | 017+ 014      | - 22+ 57   | .          |            | -150+240 |
| B305389        | 05/31/89     | 2   | 10+7        | 6+3        | .               | 2+ 1        | 3 2+ 5      | 1+ .5           | 03+ 02        | 0+ 01         | 4+ 6       | 6+ 3       |            | 100+160  |
| B305389        | 08/23/89     | 3   | 24+10       | 12+4       | .               | 1+ 1        | 3 8+ 5      | 2+ .5           | 0+ 01         | 0+ 01         | - 2+ 5     | 7+ 5       |            | 300+230  |
| B305389        | 10/12/89     | 4   | 3 4+1.1     | 6 5+2      | .               | 1+ 21       | 2 17+ 95    | 44+ 37          | 007+ 006      |               | 26+ 43     |            |            | -70+110  |

The table format is    concentration + counting error    Qtr=Quarter    =Missing data

Dissolved Radiochemical Concentrations for 1989 Background Ground Water Stations  
(Concentration units pCi/L)

page 4

| Station Number | Date Sampled | Gross Alpha         | Gross Beta | Uranium 233, 234 | Uranium 235 | Uranium 238 | Strontium 89, 90 | Plutonium 239 | Americium 241 | Cesium 137 | Radium 226 | Radium 228 | Tritium  |
|----------------|--------------|---------------------|------------|------------------|-------------|-------------|------------------|---------------|---------------|------------|------------|------------|----------|
| B400189        | 06/15/89     | 2+2                 | 13+3       | 0+1              | 0+1         | 0+1         | .1+4             | 0+01          | 0+01          | 0+5        |            |            | 200+210  |
| B400189        | 08/09/89     | 1+1                 | 0+1        |                  | 0+1         | -1+2        | 0+7              | 0+01          | 0+01          | -2+6       |            |            | 300+210  |
| B400289        | 06/15/89     | 0+1                 | 1+2        |                  | 0+3         | .7+2        | 0+4              | 0+01          | 0+01          | 0+4        |            |            | 160+210  |
| B400289        | 08/09/89     | 1+2                 | 1+1        |                  | 0+1         | -1+2        | 1+5              | 0+01          | 0+01          | -.1+6      |            |            | 190+210  |
| B400389        | 06/16/89     | 6+3                 | 2+2        |                  | 0+1         | .4+2        | 0+4              | 0+01          | 0+01          | 2+6        | 4+5        |            | 150+150  |
| B400489        | 06/15/89     | 2+2                 | -1+2       |                  | 0+1         | 3+1         | 1+4              | 0+01          | 0+01          | 0+5        |            |            | 30+210   |
| B400489        | 08/17/89     | 1+3                 | 1+2        |                  | 0+1         | 2+2         | .4+5             | 0+01          | 0+01          | 4+5        |            |            | 250+200  |
| B401989        | 05/04/89     | 1+3                 | 2+2        |                  | 0+1         | 4+2         | 0+5              | 0+01          | 0+01          | -6+6       |            |            | 100+150  |
| B401989        | 05/04/89     | 0+3                 | 2+2        |                  | 0+1         | 3+2         | .1+5             | 0+01          | 0+01          | -1+6       |            |            | 140+150  |
| B401989        | 10/10/89     | 9+8                 | 5 1+2 5    |                  | 09+18       | 81+54       | 28+28            | 008+005       | -002+014      | 0+5        |            |            | -40+260  |
| B402189        | 06/05/89     | 7+5                 | 2+3        |                  | 0+1         | 6+2         | -1+6             | 0+01          | 01+01         | 3+7        | 4+1        |            | 100+210  |
| B402189        | 08/24/89     | 6+6                 | 4+3        |                  | 0+1         | .4+2        | -1+5             | 0+01          | 0+01          | -5+5       | 3+3        |            | -60+230  |
| B402189        | 10/09/89     | 2 3+9               | 2 5+1 8    |                  | 09+18       | 62+59       | 52+34            | 007+005       | 016+016       | 0+38       |            |            | 40+240   |
| B402189        | 10/09/89     | 3 3+1               | 2+1 9      |                  | -07+14      | 35+37       | 26+38            | 001+004       | 006+012       | -02+38     |            |            | -30+240  |
| B402689        | 04/27/89     | 3+8                 | 7+4        |                  | .1+1        | 2 8+5       | -.1+5            | 0+01          | -01+01        | 0+6        |            |            | 380+150  |
| B405289        | 09/22/89     | 3                   |            |                  | 37+39       | 11 59+1 72  | 02+19            |               |               |            |            |            | -320+350 |
| B405289        | 10/27/89     | 4 38.9+4 8 43 8+5 7 |            |                  |             |             |                  |               |               | 85+54      |            |            | 80+190   |
| B405489        | 06/21/89     | 5+3                 | 7+2        |                  | 0+1         | 1.7+3       | 0+4              | 0+01          | 0+01          | -.1+5      | 4+5        |            | -70+210  |
| B405489        | 08/25/89     | 10+3                | 4+1        |                  | 1+1         | 1+3         | -2+4             | 0+01          | 0+01          | 0+5        | 4+2        |            | 250+220  |
| B405586        | 06/08/89     | 0+2                 | 8+3        | 1+1              | 0+1         | 1+1         | 1+5              | 0+01          | 0+01          | 3+6        | 025+25     |            | 80+140   |
| B405689        | 06/15/89     | 3+3                 | 1+2        |                  | 0+1         | 1 1+3       | 1+4              | 0+01          | 0+01          | 3+5        |            |            | 190+210  |
| B405689        | 08/21/89     | 5+3                 | 3+2        |                  | 1+1         | 9+2         | -.3+3            | 0+01          | 0+01          | 3+6        | 4+2        |            | 80+220   |
| B405689        | 10/25/89     | 2 4+8               | 3 4+1 7    |                  | 09+18       | 88+56       | -18+38           |               |               | 3+39       |            |            | 50+210   |
| B405789        | 06/16/89     | 1+2                 | 2+2        |                  | 0+1         | 0+1         | -1+4             | 0+01          | 0+01          | 3+6        |            |            | 80+150   |

The table format is concentration + counting error qtr=Quarter =Missing data

Dissolved Radiochemical Concentrations for 1989 Background Ground Water Stations  
(Concentration units pCi/l)

page 5

| Station<br>Number | Date<br>Sampled | Qtr | Gross<br>Alpha | Gross<br>Beta | Uranium<br>233,234 | Uranium<br>235 | Uranium<br>238 | Strontium<br>89,90 | Plutonium<br>239 | Americium<br>241 | Cesium<br>137 | Radium<br>226 | Radium<br>228 | Tritium  |
|-------------------|-----------------|-----|----------------|---------------|--------------------|----------------|----------------|--------------------|------------------|------------------|---------------|---------------|---------------|----------|
| B405789           | 08/18/89        | 3   | 0+3            | 0+2           | .                  | 0+ 1           | 3+ 2           | 4+ 5               | 0+ 01            | 0+ 01            | - 4+ 5        |               |               | 390+200  |
| B405889           | 06/14/89        | 2   | 3+3            | 0+2           |                    | 0+ 1           | 1+ 1           | - 2+ 5             | 01+ 01           | 0+ 01            | 0+ 6          |               |               | -40+150  |
| B405889           | 06/14/89        | 2   | 1+2            | 2+2           | .                  | 0+ 1           | 1+ 1           | 0+ 3               | 0+ 01            | 0+ 01            | 3+ 6          |               |               | 0+150    |
| B405889           | 08/23/89        | 3   | 8+4            | 2+1           | .                  | 0+ 1           | 1+ 1           | 4+ 5               | 0+ 01            | 0+ 01            | - 5+ 5        | 4+ 2          |               | 100+240  |
| B405889           | 10/18/89        | 4   | .7+ 5          | .9+1.6        |                    | 13+ 26         | 53+ 65         | 12+ 4              | 006+ 005         |                  | 17+ 37        |               |               | -100+230 |

The table format is    concentration + counting error    Qtr=Quarter    =Missing data

## Field Parameters for 1989 Background Ground Water Stations

page 1

| Station Number | Date Sampled | Qtr | Temperature degrees C | pH unit | Oxygen mg/l | Conductivity umhos/cm |
|----------------|--------------|-----|-----------------------|---------|-------------|-----------------------|
| B102289        | 04/25/89     | 2   | 10.0000               | 7.00    |             | 130.0000              |
| B102289        | 07/13/89     | 3   | 14.0000               | 7.00    |             | 170.0000              |
| B102289        | 10/13/89     | 4   | 14.0000               | 7.10    | .           | 180.0000              |
| B102389        | 04/25/89     | 2   | 9.0000                | 6.70    |             | 250.0000              |
| B102389        | 07/14/89     | 3   | 17.0000               | 6.60    | .           | 380.0000              |
| B200589        | 06/07/89     | 2   | 10.5000               | 7.00    |             | 150.0000              |
| B200589        | 07/31/89     | 3   | 14.0000               | 7.80    |             | 140.0000              |
| B200589        | 07/31/89     | 3   | 14.0000               | 7.80    |             | 140.0000              |
| B200589        | 11/06/89     | 4   | 13.0000               | 6.60    |             | 200.0000              |
| B200689        | 06/07/89     | 2   | 11.0000               | 7.20    |             | 200.0000              |
| B200689        | 07/27/89     | 3   | 14.0000               | 7.40    |             | 200.0000              |
| B200689        | 11/03/89     | 4   | 12.0000               | 6.60    |             | 270.0000              |
| B200789        | 06/06/89     | 2   | 11.0000               | 7.40    |             | 220.0000              |
| B200789        | 07/31/89     | 3   | 15.0000               | 7.60    |             | 280.0000              |
| B200789        | 07/31/89     | 3   | 15.0000               | 7.60    |             | 280.0000              |
| B200789        | 10/11/89     | 4   | 14.5000               | 6.70    |             | 270.0000              |
| B200789        | 10/11/89     | 4   | 14.5000               | 6.70    |             | 270.0000              |
| B200889        | 06/05/89     | 2   | 12.2000               | 8.60    |             | 205.0000              |
| B200889        | 07/27/89     | 3   | 15.0000               | 7.60    |             | 320.0000              |
| B200889        | 10/05/89     | 4   | 19.0000               | 7.45    |             | 300.0000              |
| B200889        | 10/05/89     | 4   | 19.0000               | 7.45    |             | 300.0000              |
| B201189        | 05/05/89     | 2   | 10.0000               | 7.20    | .           | 550.0000              |
| B201189        | 07/21/89     | 3   | 15.0000               | 7.30    | .           | 950.0000              |
| B201189        | 10/26/89     | 4   | 11.0000               | 7.70    | .           | 670.0000              |
| B201289        | 07/28/89     | 3   | 15.0000               | 7.40    | .           | 1725.0000             |
| B201289        | 10/26/89     | 4   | 14.0000               | 7.40    | .           | 1500.0000             |
| B202489        | 04/24/89     | 2   | 12.0000               | 7.00    |             | 265.0000              |

U=Analyzed but not detected

A=Acceptable with qualifications

J=Present below detection limit

V=Valid and acceptable

E=Estimated value

R=Rejected

=Missing

Qtr=Quarter

## Field Parameters for 1989 Background Ground Water Stations

| Station<br>Number | Date<br>Sampled | Qtr | Temperature<br>degrees C | pH<br>unit | Oxygen<br>mg/L | Conductivity<br>umhos/cm |
|-------------------|-----------------|-----|--------------------------|------------|----------------|--------------------------|
| B202489           | 04/24/89        | 2   | 12 0000                  | 7 00       |                | 265 0000                 |
| B202489           | 08/21/89        | 3   | 15 0000                  | 7 30       |                | 610 0000                 |
| B202489           | 10/12/89        | 4   | 18 0000                  | 7 10       |                | 450 0000                 |
| B202589           | 04/26/89        | 2   | 11 0000                  | 7 30       |                | 265 0000                 |
| B202589           | 07/14/89        | 3   | 16 0000                  | 6 80       |                | 480 0000                 |
| B202589           | 10/13/89        | 4   | 16 0000                  | 7 00       |                | 480 0000                 |
| B203189           | 10/24/89        | 4   | 15 0000                  | 7 40       |                | 4100 0000                |
| B203189           | 08/18/89        | 3   | 18 0000                  | 7 80       |                | 260 0000                 |
| B203289           | 06/20/89        | 2   | 15 0000                  | 8 00       |                | 400 0000                 |
| B203289           | 08/07/89        | 3   | 16 0000                  | 7 60       |                | 420 0000                 |
| B203289           | 11/06/89        | 4   | 13 0000                  | 7 00       |                | 520 0000                 |
| B203489           | 09/27/89        | 3   | 15 0000                  | 7 60       |                | 480 0000                 |
| B203489           | 12/18/89        | 4   | 13 5000                  | 8 40       |                | 400 0000                 |
| B203589           | 08/21/89        | 3   | 15 0000                  | 8 00       |                | 320 0000                 |
| B203589           | 10/24/89        | 4   | 14 3000                  | 8 15       |                | 385 0000                 |
| B203689           | 05/25/89        | 2   | 11 0000                  | 7 80       |                | 230 0000                 |
| B203689           | 05/25/89        | 2   | 11 0000                  | 7 80       |                | 230 0000                 |
| B203789           | 06/29/89        | 2   | 12 0000                  | 10 00      |                | 260 0000                 |
| B203789           | 08/29/89        | 3   | 16 0000                  | 8 00       |                | 330 0000                 |
| B203789           | 11/27/89        | 4   | 12 0000                  | 8 00       |                | 400 0000                 |
| B203889           | 06/28/89        | 2   | 20 0000                  | 9 80       |                | 340 0000                 |
| B203989           | 06/16/89        | 2   | 13 0000                  | 9 00       |                | 320 0000                 |
| B203989           | 08/18/89        | 3   | 15 0000                  | 8 50       |                | 300 0000                 |
| B203989           | 11/10/89        | 4   | 13 0000                  | 8 60       |                | 320 0000                 |
| B204089           | 07/06/89        | 3   | 17 0000                  | 9 70       |                | 1000 0000                |

U=Analyzed but not detected  
A=Acceptable with qualifications  
J=Present below detection limit  
V=Valid and acceptable  
E=Estimated value  
R=Rejected  
=Missing  
Qtr=Quarter

# Field Parameters for 1989 Background Ground Water Stations

page 3

| Station<br>Number | Date<br>Sampled | Qtr | Temperature<br>degrees C | pH<br>pH unit | Oxygen<br>mg/L | Conductivity<br>umhos/cm |
|-------------------|-----------------|-----|--------------------------|---------------|----------------|--------------------------|
| B204089           | 08/31/89        | 3   | 17.0000                  | 8.10          |                | 1100 0000                |
| B204089           | 10/13/89        | 4   | 13 0000                  | 8.80          |                | 162 0000                 |
| B204189           | 06/27/89        | 2   | 12.0000                  | 10.40         |                | 1800 0000                |
| B204189           | 08/24/89        | 3   | 15.0000                  | 9.40          |                | 1800 0000                |
| B204189           | 10/12/89        | 4   | 15 2000                  | 9.10          |                | 240 0000                 |
| B205589           | 07/21/89        | 3   | 15.0000                  | 7.30          |                | 1400 0000                |
| B205589           | 10/25/89        | 4   | 15 0000                  | 7.30          |                | 1800 0000                |
| B302089           | 07/25/89        | 3   | 14 0000                  | 7.70          |                | 840 0000                 |
| B302789           | 04/26/89        | 2   | 10 0000                  | 7.50          |                | 370.0000                 |
| B302889           | 04/27/89        | 2   | 11 0000                  | 7.50          |                | 410 0000                 |
| B302889           | 07/18/89        | 3   | 18 0000                  | 7.00          |                | 840 0000                 |
| B302889           | 10/12/89        | 4   | 17 0000                  | 7.50          |                | 730 0000                 |
| B302989           | 04/27/89        | 2   | 9 0000                   | 7.50          |                | 475 0000                 |
| B302989           | 07/19/89        | 3   | 17.0000                  | 7.20          |                | 900 0000                 |
| B302989           | 10/24/89        | 4   | 15 0000                  | 7.60          |                | 860 0000                 |
| B303089           | 06/30/89        | 2   | 25.0000                  | 7.80          |                | 460 0000                 |
| B304289           | 06/23/89        | 2   | 21 0000                  | 9.00          |                | 760 0000                 |
| B304289           | 08/22/89        | 3   | 16 0000                  | 9.00          |                | 500 0000                 |
| B304289           | 10/11/89        | 4   | 15.0000                  | 9.40          |                | 720 0000                 |
| B304289           | 10/11/89        | 4   | 15 0000                  | 9.40          |                | 720 0000                 |
| B304889           | 08/22/89        | 3   | 13 0000                  | 7.00          |                | 1400 0000                |
| B304989           | 06/23/89        | 2   | 21 0000                  | 8.90          |                | 890 0000                 |
| B304989           | 08/23/89        | 3   | 15.0000                  | 8.30          |                | 800 0000                 |
| B304989           | 10/11/89        | 4   | 14 0000                  | 8.00          |                | 860 0000                 |

U=Analyzed but not detected  
A=Acceptable with qualifications

J=Present below detection limit  
V=Valid and acceptable

E=Estimated value  
R=Rejected

=Missing  
Qtr=Quarter

Field Parameters for 1989 Background Ground Water Stations

| Station Number | Date Sampled | Qtr | Temperature degrees C | pH   | pH Unit | Oxygen mg/L | Conductivity umhos/cm |
|----------------|--------------|-----|-----------------------|------|---------|-------------|-----------------------|
| B305389        | 05/31/89     | 2   | 12 0000               | 7 30 |         | .           | 570 0000              |
| B305389        | 08/22/89     | 3   | 17 0000               | 7 40 |         |             | 400.0000              |
| B305389        | 10/12/89     | 4   | 14 0000               | 7 40 |         |             | 780.0000              |
| B400189        | 06/15/89     | 2   | 11 0000               | 6 60 |         |             | 140.0000              |
| B400189        | 08/09/89     | 3   | 15 0000               | 6 70 |         |             | 110.0000              |
| B400189        | 10/31/89     | 4   | 12 5000               | 8 40 |         | .           | 140.0000              |
| B400289        | 06/15/89     | 2   | 11 5000               | 6 70 |         | .           | 160 0000              |
| B400289        | 08/09/89     | 3   | 15 0000               | 6 90 |         |             | 140 0000              |
| B400289        | 11/01/89     | 4   | 11 0000               | 7 00 |         |             | 800 0000              |
| B400389        | 06/16/89     | 2   | 11 5000               | 7 40 |         |             | 380 0000              |
| B400389        | 11/02/89     | 4   | 11 5000               | 6 80 |         |             | 500 0000              |
| B400489        | 06/15/89     | 2   | 13 0000               | 7 00 |         |             | 210 0000              |
| B400489        | 08/17/89     | 3   | 15 0000               | 7 80 |         |             | 210 0000              |
| B401989        | 05/04/89     | 2   | 9.0000                | 7 10 |         |             | 340 0000              |
| B401989        | 05/04/89     | 2   | 9.0000                | 7.10 |         |             | 340 0000              |
| B401989        | 07/24/89     | 3   | 14 0000               | 7.00 |         |             | 500 0000              |
| B401989        | 10/10/89     | 4   | 14 0000               | 6 70 |         |             | 520 0000              |
| B402189        | 06/05/89     | 2   | 10.0000               | 8.40 |         |             | 345 0000              |
| B402189        | 08/24/89     | 3   | 18.0000               | 6 90 |         |             | 440 0000              |
| B402189        | 10/09/89     | 4   | 12 0000               | 7 30 |         | .           | 430 0000              |
| B402189        | 10/09/89     | 4   | 12.0000               | 7 30 |         |             | 430 0000              |
| B402689        | 04/27/89     | 2   | 14 0000               | 7 10 |         |             | 500 0000              |
| B405489        | 06/21/89     | 2   | 23 0000               | 8 10 |         |             | 325 0000              |
| B405489        | 08/25/89     | 3   | 16.0000               | 8 00 |         |             | 160 0000              |
| B405489        | 11/08/89     | 4   | 12 0000               | 7 00 |         |             | 320 0000              |
| B405586        | 01/05/89     | 1   | 12 1000               | 7 80 |         |             | 210 0000              |

U=Analyzed but not detected  
A=Acceptable with qualifications  
J=Present below detection limit  
V=Valid and acceptable  
E=Estimated value  
R=Rejected  
.=Missing  
Qtr=Quarter

## Field Parameters for 1989 Background Ground Water Stations

| Station<br>Number | Date<br>Sampled | Qtr | Temperature<br>degrees C | pH<br>Unit | Oxygen<br>mg/L | Conductivity<br>umhos/cm |
|-------------------|-----------------|-----|--------------------------|------------|----------------|--------------------------|
| B405586           | 04/12/89        | 2   | 10 7000                  | 6 50       | .              | 180 0000                 |
| B405586           | 07/31/89        | 3   | 15 1000                  | 6.30       |                | 210 0000                 |
| B405586           | 06/08/89        | 2   | 11.0000                  | 7 10       |                | 180 0000                 |
| B405586           | 08/28/89        | 3   | 15.0000                  | 7 15       |                | 210 0000                 |
| B405586           | 11/10/89        | 4   | 14 5000                  | 6 60       |                | 200 0000                 |
| B405689           | 06/15/89        | 2   | 11 0000                  | 7 50       |                | 340 0000                 |
| B405689           | 08/21/89        | 3   | 15 0000                  | 6 80       |                | 400.0000                 |
| B405689           | 10/25/89        | 4   | 14.0000                  | 7 60       |                | 460 0000                 |
| B405789           | 06/16/89        | 2   | 13.0000                  | 7 00       |                | 190 0000                 |
| B405789           | 08/18/89        | 3   | 19.0000                  | 7 20       |                | 230 0000                 |
| B405789           | 11/10/89        | 4   | 15 0000                  | 7.20       |                | 220 0000                 |
| B405889           | 06/14/89        | 2   | 9.0000                   | 7 00       |                | 250 0000                 |
| B405889           | 06/14/89        | 2   | 9 0000                   | 7 00       |                | 250.0000                 |
| B405889           | 08/23/89        | 3   | 13 0000                  | 7 00       | .              | 200 0000                 |
| B405889           | 10/18/89        | 4   | 10 0000                  | 7 00       | .              | 280 0000                 |

U=Analyzed but not detected      J=Present below detection limit      E=Estimated value      =Missing  
A=Acceptable with qualifications      V=Valid and acceptable      R=Rejected      Qtr=Quarter

Total Samples, by analyte group, for 1989 Background Borehole Stations

| <u>Station<br/>Number</u> | <u>Total</u>  |                       |
|---------------------------|---------------|-----------------------|
|                           | <u>Metals</u> | <u>Radiochemicals</u> |
| B200589                   | 9             | 7                     |
| B200689                   | 7             | 7                     |
| B200789                   | 7             | 7                     |
| B200889                   | 7             | 7                     |
| B200989                   | 6             | 2                     |
| B201089                   | 5             | 5                     |
| B201189                   | 10            | 9                     |
| B201289                   | 7             | 7                     |
| B201489                   | 5             | 6                     |
| B201589                   | 4             | 5                     |
| B301889                   | 0             | 6                     |
| B302089                   | 5             | 5                     |
| B400189                   | 9             | 0                     |
| B400289                   | 9             | 9                     |
| B400389                   | 10            | 10                    |
| B400489                   | 13            | 13                    |
| B401989                   | 6             | 6                     |
| B402189                   | 4             | 4                     |

Total Metal Concentrations for 1989 Background Borehole Stations  
(Concentration units mg/kg)

page 1

| Station Number | Date Sampled | Qtr            | Depth          | Aluminum (Al) | Antimony (Sb)   | Arsenic (As) | Barium (Ba)   | Beryllium (Be) | Cadmium (Cd) | Calcium (Ca) | Cesium (Cs)    | Chromium (Cr) | Cobalt (Co) | Copper (Cu)  | Iron (Fe) | Lead (Pb) |
|----------------|--------------|----------------|----------------|---------------|-----------------|--------------|---------------|----------------|--------------|--------------|----------------|---------------|-------------|--------------|-----------|-----------|
| 1              | 8200589      | 02/22/89       | 1              | 00-03         | 21400           | 14 U         | 88.8          | 1.5            | 3 2          | 3100         | 234 U          | 15 3          | 18 2        | 11.3         | 21700     | 13        |
| 2              | 8200589      | 02/22/89       | 1              | 03-08         | 9900 V          | 12 5 UA      | 48.4 V        | 1 V            | 1 4 V        | 2690 V       | 209 UV         | 8.4 A         | 16.6 A      | 15 3 A       | 19800 A   | 6 8 V     |
| 3              | 8200589      | 02/22/89       | 1              | 03-08         | 10100 V         | 12 4 UA      | 48 2 V        | 1 UV           | 1 8 V        | 2340 V       | 208 UV         | 8 6 A         | 17 5 A      | 12 4 A       | 17200 V   | 6 7 V     |
| 4              | 8200589      | 02/22/89       | 1              | 09-13         | 7690 UV         | 12 8 UA      | 42.5 UV       | 1 1 UV         | 1 3 V        | 1630 V       | 212 UV         | 7 A           | 12 3 A      | 16 6 A       | 15700 V   | 10 3 V    |
| 5              | 8200589      | 02/22/89       | 1              | 13-17         | 12300 V         | 14.3 UA      | 54 2 V        | 1 2 UV         | 1 5 V        | 3600 V       | 239 UV         | 12 3 V        | 14.9 A      | 10 3 A       | 13900 V   | 9 7 V     |
| 6              | 8200589      | 02/22/89       | 1              | 17-23         | 5510 V          | 13 8 UA      | 45.8 UV       | 1.1 UV         | 1.1 UV       | 1150 V       | 229 UV         | 4.1 A         | 11 5 UA     | 7 8 A        | 7590 V    | 2 8 V     |
| 7              | 8200589      | 02/22/89       | 1              | 23-25         | 4160            | 14 1 U       | 46.8 U        | 1 28 U         | 1.2 U        | 1170 U       | 234 U          | 4             | 11.7 U      | 6 3          | 6610      | 2 9       |
| 8              | 8200589      | 02/23/89       | 1              | 25-30         | 5640 V          | 13 UA        | 43 4 UA       | 1 1 UV         | 1 1 UR       | 1340 V       | 217 UV         | 5 6 A         | 12 2 A      | 11 A         | 8700 V    | 4.1 A     |
| 9              | 8200589      | 03/08/89       | 1              | 00-03         | 25800           | 15 7 U       | 137           | 11 8           | 1 3 U        | 2520         | 261 U          | 16.4          | 13          | 6 8          | 19100     | 21 8      |
| 10             | 8200689      | 02/28/89       | 1              | 01-04         | 19900 A         | 13.6 UR      | 75.7 V        | 1 9 A          | 1 1 UA       | 2920 V       | 228 UV         | 48 5 V        | 11 4 UV     | 7 6 V        | 18400 V   | 21 9 V    |
| 11             | 8200689      | 02/28/89       | 1              | 04-10         | 8610 A          | 14 4 UR      | 54 6 V        | 1.2 UA         | 1 2 UA       | 1830 V       | 239 UV         | 69 6 V        | 12 UV       | 7.3 V        | 11100 V   | 5 6 V     |
| 12             | 8200689      | 02/28/89       | 1              | 10-16         | 8640            | 13 U         | 47            | 1 1 U          | 1 1 U        | 2150         | 216 U          | 12            | 10 8 U      | 8.9          | 9340      | 4 6       |
| 13             | 8200689      | 02/28/89       | 1              | 16-18         | 14100 A         | 15 UR        | 104 V         | 1 3 UA         | 1 3 UA       | 5500 V       | 251 UV         | 14 3 V        | 12 5 UV     | 13 2 V       | 17600 V   | 6.5 V     |
| Station Number | Lithium (Li) | Magnesium (Mg) | Manganese (Mn) | Mercury (Hg)  | Molybdenum (Mo) | Nickel (Ni)  | Potassium (K) | Selenium (Se)  | Silver (Ag)  | Sodium (Na)  | Strontium (Sr) | Thallium (Tl) | Tin (Sn)    | Vanadium (V) | Zinc (Zn) |           |
| 1              | 8200589      | 23 4 U         | 2310           | .23           | 34 5 U          | 19.8         | 2370          | 1 U            | 4 4          | 1170 U       | 23 4 U         | 2 1 U         | 23 4 U      | 55.5         | 30.2      |           |
| 2              | 8200589      | 20.9 UV        | 2250 A         | .11 UA        | 21 4 V          | 16 A         | 1210 A        | .89 UA         | 4 V          | 1040 UV      | 20 9 UV        | 1 8 UR        | 20.9 UV     | 54 5 V       | 19.1 A    |           |
| 3              | 8200589      | 20 8 UV        | 2430 A         | 11 UA         | 22.5 V          | 16 1 A       | 1130 A        | 92 UA          | 3 3 V        | 1040 UV      | 20 8 UV        | 1 8 UR        | 20 8 UV     | 42 6 V       | 18 9 A    |           |
| 4              | 8200589      | 21 2 UV        | 1480 A         | 11 UA         | 21 2 UV         | 13.2 A       | 1060 UA       | 77 UA          | 3 3 V        | 1060 UV      | 21 2 UV        | 1 5 UR        | 21 2 UV     | 48.3 V       | 15.8 A    |           |
| 5              | 8200589      | 23 9 UV        | 3660 A         | .12 UA        | 24.9 V          | 14 A         | 1800 A        | 89 UA          | 3 1 V        | 1190 UV      | 23 9 UV        | 1 8 UR        | 23 9 UV     | 17 1 V       | 25 9 A    |           |
| 6              | 8200589      | 22.9 UV        | 1410 A         | .12 UA        | 22 9 UV         | 9 2 UA       | 1150 UA       | 83 UA          | 2.3 UV       | 1150 UV      | 22 9 UV        | 1 7 UR        | 22 9 UV     | 17 4 V       | 10 6 A    |           |
| 7              | 8200589      | 23 4 U         | 1170 U         | 12 U          | 23 4 U          | 9 4 U        | 1170 U        | 96 U           | 2.3 U        | 1170 U       | 23 4 U         | 1 9 U         | 23 4 U      | 11 7 U       | 9.7       |           |
| 8              | 8200589      | 21.7 UV        | 1400 V         | .11 UA        | 21 7 UV         | 10 2 A       | 1080 UA       | 92 UA          | 2.2 UR       | 1080 UV      | 21.7 UV        | 1 8 UA        | 21 7 UV     | 19.8 V       | 12 6 V    |           |
| 9              | 8200589      | 26 1 U         | 3040           | 19            | 26.1 U          | 27 9         | 1310          | 1 3 U          | 6 1          | 1310 U       | 26 1 U         | 2 6 U         | 26 1 U      | 43 9         | 6         |           |
| 10             | 8200689      | 22 8 UV        | 2400 V         | 32 A          | 28 V            | 15.6 A       | 1960 V        | 8 UR           | 2 3 UA       | 1140 UV      | 22 8 UV        | 1.6 UR        | 44 V        | 46 1 V       | 30 6 V    |           |
| 11             | 8200689      | 23 9 UV        | 2430 V         | .31 A         | 23.9 UV         | 9 6 UR       | 1200 UV       | 1.1 UR         | 2 4 UA       | 1200 UV      | 23 9 UV        | 2 2 UR        | 37 4 V      | 26 V         | 19.4 V    |           |
| 12             | 8200689      | 21 6 U         | 2110           | 25            | 21 6 U          | 8 7 U        | 1410          | 1.1 U          | 2.2 U        | 1080 U       | 21 6 U         | 2 2 U         | 29.6        | 20 7         | 18        |           |
| 13             | 8200689      | 25 1 UV        | 3440 V         | 19 A          | 25 1 UV         | 10 UR        | 2180 V        | 1 1 UR         | 2 5 UA       | 1250 UV      | 27.1 V         | 2 2 UR        | 27 3 V      | 28 3 V       | 25 5 V    |           |

U=Analyzed but not detected J=Present below detection limit E=Estimated value  
A=Acceptable with qualifications V=Valid and acceptable R=Rejected Qtr=Quarter

**Total Metal Concentrations for 1989 Background Borehole Stations**  
(Concentration units mg/kg)

page 2

| Station Number | Date Sampled | Qtr            | Depth          | Aluminum (Al) | Antimony (Sb)   | Arsenic (As) | Barium (Ba)   | Beryllium (Be) | Cadmium (Cd) | Calcium (Ca) | Cesium (Cs)    | Chromium (Cr) | Cobalt (Co) | Copper (Cu)  | Iron (Fe) | Lead (Pb) |
|----------------|--------------|----------------|----------------|---------------|-----------------|--------------|---------------|----------------|--------------|--------------|----------------|---------------|-------------|--------------|-----------|-----------|
| 14             | B200689      | 02/28/89       | 1              | 18-24         | 8910 A          | 13 UR        | 120 V         | 6.1 V          | 1.1 UA       | 3250 V       | 216 UV         | 15 V          | 11.1 V      | 9.2 V        | 11000 V   | 3.9 V     |
| 15             | B200689      | 02/28/89       | 1              | 24-30         | 5770 UA         | 13.4 UR      | 58.5 V        | 6.7 V          | 1.1 UA       | 2580 V       | 224 UV         | 9.7 V         | 11.2 UV     | 15 V         | 11600 V   | 4.2 V     |
| 16             | B200689      | 03/09/89       | 1              | 00-03         | 30300           | 14.5 U       | 107           | 6.7            | 1.2 U        | 3890         | 242 U          | 27.1          | 12.1 U      | 11.8         | 23900     | 21.8      |
| 17             | B200789      | 03/01/89       | 1              | 01-03         | 31800           | 15.1 U       | 195           | 19             | 1.3 U        | 11000        | 252 U          | 42.6          | 13.4        | 14.9         | 26600     | 17.4      |
| 18             | B200789      | 03/01/89       | 1              | 03-06         | 13500 V         | 12.9 UA      | 133 V         | 6.5 V          | 1.1 UA       | 157000       | 216 UV         | 9.8 A         | 10.8 UV     | 7.1 V        | 9590 V    | 5.3 V     |
| 19             | B200789      | 03/01/89       | 1              | 06-12         | 7400 V          | 13 UA        | 46.5 V        | 6.1 V          | 1.5 A        | 8320 V       | 217 UV         | 15.5 A        | 10.8 UV     | 8.8 V        | 9440 V    | 4.4 V     |
| 20             | B200789      | 03/01/89       | 1              | 12-18         | 6470 V          | 13 UA        | 43.3 UV       | 7.1 V          | 1.3 A        | 2770 V       | 217 UV         | 16.1 A        | 10.8 UV     | 9.9 V        | 11400 V   | 4 V       |
| 21             | B200789      | 03/01/89       | 1              | 18-24         | 3030 V          | 13.5 UA      | 45.1 UV       | 2.1 A          | 1.1 UA       | 1470 V       | 225 UV         | 7.4 A         | 11.3 UV     | 6.3 V        | 5550 V    | 3.9 V     |
| 22             | B200789      | 03/01/89       | 1              | 24-26         | 6680 V          | 14.2 UA      | 47.4 UV       | 3.9 V          | 1.2 UA       | 2410 V       | 237 UV         | 7.9 A         | 11.9 UV     | 9.7 V        | 8180 V    | 2.7 V     |
| 23             | B200789      | 03/08/89       | 1              | 00-03         | 19300           | 13.8 UA      | 120 V         | 9.7 V          | 1.1 UV       | 3940 A       | 230 UV         | 19.4 V        | 11.5 UA     | 10.2 V       | 17600     | 21.6 V    |
| 24             | B200889      | 03/06/89       | 1              | 01-06         | 16800 A         | 13.5 UA      | 148 A         | 9.9 A          | 1.1 UV       | 9310 V       | 225 UV         | 17.4 A        | 11.2 UV     | 8.8 V        | 15800 V   | 8 A       |
| 25             | B200889      | 03/06/89       | 1              | 01-06         | 18800 A         | 13.4 UA      | 192 A         | 13.3 A         | 1.1 UV       | 7750 V       | 224 UV         | 22.7 A        | 28.1 V      | 8.6 V        | 20900 V   | 25.7 A    |
| Station Number | Lithium (Li) | Magnesium (Mg) | Manganese (Mn) | Mercury (Hg)  | Molybdenum (Mo) | Nickel (Ni)  | Potassium (K) | Selenium (Se)  | Silver (Ag)  | Sodium (Na)  | Strontium (Sr) | Thallium (Tl) | Tin (Sn)    | Vanadium (V) | Zinc (Zn) |           |
| 14             | B200689      | 21.6 UV        | 1870 V         | 656 A         | 13 A            | 21.6 UV      | 22.2 A        | 1.1 UR         | 2 A          | 1080 UV      | 21.6 UV        | 2.2 UR        | 21.6 UV     | 13.8 V       | 24.3 V    |           |
| 15             | B200689      | 22.4 UV        | 1540 V         | 222 A         | 17 A            | 22.4 UV      | 20.5 A        | 99 UR          | 2.2 UA       | 1120 UV      | 22.4 UV        | 2 UR          | 22.4 UV     | 29.8 V       | 43.2 V    |           |
| 16             | B200689      | 16.1           | 3380           | 102           | .12 U           | 18.5         | 35.1          | 1.2 U          | 40.9         | 1210 U       | 26.2           | 2.5 U         | 312         | 60.5         | 36.8      |           |
| 17             | B200789      | 25.2 U         | 4380           | 221           | 13 U            | 41           | 54.2          | 1.2 U          | 3.3          | 1260 U       | 33.2           | 2.4 U         | 43.9        | 70           | 77.6      |           |
| 18             | B200789      | 21.6 UV        | 5260 V         | 66.4 V        | 11 UV           | 21.6 UV      | 17.4 A        | 5.5 UA         | 2.2 UR       | 1080 UV      | 226 V          | 2.2 UA        | 21.6 UR     | 21.3 V       | 30.5 A    |           |
| 19             | B200789      | 21.7 UV        | 2040 V         | 73.5 V        | 11 UV           | 21.7 UV      | 15 A          | 5.3 UA         | 2.2 UV       | 1080 UV      | 21.7 UV        | 2.1 UV        | 28.2 V      | 22.1 V       | 35.7 A    |           |
| 20             | B200789      | 21.7 UV        | 1590 V         | 96.6 V        | .11 UV          | 21.7 UV      | 10.9 A        | 5.3 U          | 2.2 UV       | 1080 UV      | 21.7 UV        | 2.1 UV        | 27.3 V      | 19.8 V       | 30.6 A    |           |
| 21             | B200789      | 22.5 UV        | 1130 UV        | 120 V         | .12 UV          | 22.5 UV      | 9 UA          | 5.9 UA         | 2.3 UV       | 1130 UV      | 22.5 UV        | 2.3 UA        | 22.5 UV     | 12 V         | 12.8 A    |           |
| 22             | B200789      | 23.7 UV        | 1330 V         | 75.8 V        | 12 UV           | 23.7 UV      | 9.6 A         | 6 UA           | 2.4 UV       | 1190 UV      | 23.7 UV        | 2.4 UA        | 23.7 UV     | 18.8 V       | 21.5 A    |           |
| 23             | B200789      | 23 UV          | 3150 A         | 210           | 12 UV           | 23.6 V       | 9.9 A         | 1.2 UA         | 2.3 UV       | 1150 UV      | 23.3 V         | 2.4 UA        | 34.2 A      | 36.4 V       | 40.7 A    |           |
| 24             | B200889      | 22.5 UV        | 3110 V         | 136 A         | 11 UV           | 22.5 UA      | 23.3 A        | 1.1 UA         | 2.2 UA       | 1120 UV      | 33.8 V         | 2.2 UR        | 22.5 UV     | 35.3 V       | 27.8 A    |           |
| 25             | B200889      | 22.4 UV        | 3000 V         | 380 A         | 14 R            | 22.4 UA      | 27.7 A        | 1.1 UA         | 2.2 UA       | 1120 UV      | 33.7 V         | 2.2 UR        | 22.4 UV     | 59.7 V       | 29.3 A    |           |

U=Analyzed but not detected      J=Present below detection limit      E=Estimated value      =Missing  
A=Acceptable with qualifications      V=Valid and acceptable      R=Rejected      Qtr=Quarter

Total Metal Concentrations for 1989 Background Borehole Stations  
(Concentration units mg/kg)

page 3

| Station Number | Date Sampled | Qtr            | Depth          | Aluminum (Al) | Antimony (Sb)   | Arsenic (As) | Barium (Ba)   | Beryllium (Be) | Cadmium (Cd) | Calcium (Ca) | Cesium (Cs)    | Chromium (Cr) | Cobalt (Co) | Copper (Cu)  | Iron (Fe) | Lead (Pb) |
|----------------|--------------|----------------|----------------|---------------|-----------------|--------------|---------------|----------------|--------------|--------------|----------------|---------------|-------------|--------------|-----------|-----------|
| 26             | B200889      | 03/06/89       | 1              | 06-08         | 5780 A          | 13 4 UA      | 44.5 UA       | 4 A            | 1.1 UV       | 14000 V      | 223 UV         | 17.7 A        | 11.1 UV     | 5 6 UV       | 5750 V    | 4.9 A     |
| 27             | B200889      | 03/06/89       | 1              | 08-14         | 8330 A          | 13 2 UA      | 49 A          | 7.1 A          | 1.1 UV       | 2680 V       | 220 UV         | 12.7 A        | 11 UV       | 8.8 V        | 11900 V   | 7 1 A     |
| 28             | B200889      | 03/06/89       | 1              | 14-20         | 7170 A          | 13 1 UA      | 43.8 A        | 5.3 A          | 1 1 UV       | 1980 V       | 219 UV         | 9 5 A         | 11 UV       | 8.3 V        | 8400 V    | 3 1 A     |
| 29             | B200889      | 03/06/89       | 1              | 20-22         | 5260 A          | 13 4 UA      | 128 A         | 5.5 A          | 1 1 UV       | 2060 V       | 223 UV         | 6 9 A         | 11 1 UV     | 10 4 V       | 8650 V    | 6.7 V     |
| 30             | B200889      | 03/08/89       | 1              | 00-03         | 14900           | 15 3 UR      | 5 9 A         | 8.7 V          | 1 3 UV       | 3610 A       | 255 UV         | 18 2 V        | 12 8 UA     | 12.2 V       | 15400     | 19 9 V    |
| 31             | B200989      | 03/02/89       | 1              | 01-04         | 40800 E         | 16 4 UR      | 8 A           | 209 V          | 18 3 V       | 7270 V       | 273 UV         | 34.5 V        | 13 6 UV     | 15 6 V       | 33700 E   | 21 8 V    |
| 32             | B200989      | 03/02/89       | 1              | 04-10         | 12200 V         | 12 9 UR      | 2 2 UA        | 57.9 V         | 4 6 V        | 25500 A      | 214 UV         | 5 8 A         | 10 7 UV     | 5.4 UV       | 9630 V    | 4.2 V     |
| 33             | B200989      | 03/02/89       | 1              | 04-10         | 5640 V          | 12 4 UR      | 2 2 UA        | 41 4 UV        | 1 3 A        | 9550 V       | 207 UV         | 6 A           | 10 3 UV     | 5 2 UV       | 5660 V    | 2.1 V     |
| 34             | B200989      | 03/02/89       | 1              | 10-16         | 6410 V          | 13 1 UR      | 4 A           | 47 2 V         | 6 8 V        | 2200 V       | 219 UV         | 7.9 A         | 16 4 V      | 10 1 V       | 9810 V    | 4.1 V     |
| 35             | B200989      | 03/02/89       | 1              | 16-20         | 7850 A          | 14.4 UR      | 2 4 UA        | 53.1 V         | 1.2 UR       | 3330 V       | 240 UV         | 9 9 A         | 12 UV       | 11 1 V       | 10400 V   | 8 9 V     |
| 36             | B200989      | 03/08/89       | 1              | 00-03         | 16100           | 14 UA        | 8 1 A         | 124 V          | 10.8 V       | 3930 A       | 234 UV         | 19 4 V        | 11.7 UA     | 11 9 V       | 17900     | 19.2 V    |
| 37             | B201089      | 03/02/89       | 1              | 01-06         | 17300 V         | 14 1 UR      | 1 UA          | 95 3 V         | 10 3 V       | 5330 V       | 235 UV         | 14 V          | 11 8 UV     | 18 V         | 18100 V   | 13 8 V    |
| Station Number | Lithium (Li) | Magnesium (Mg) | Manganese (Mn) | Mercury (Hg)  | Molybdenum (Mo) | Nickel (Ni)  | Potassium (K) | Selenium (Se)  | Silver (Ag)  | Sodium (Na)  | Strontium (Sr) | Thallium (Tl) | Tin (Sn)    | Vanadium (V) | Zinc (Zn) |           |
| 26             | B200889      | 22.3 UV        | 1380 V         | 30.6 A        | .11 UV          | 22 3 UA      | 8 9 UA        | 1110 UA        | 1 1 UA       | 2 2 UA       | 1110 UV        | 22 3 UV       | 2.2 UR      | 22 3 UV      | 11 7 V    | 8 9 A     |
| 27             | B200889      | 22 UV          | 1900 V         | 120 A         | 11 UV           | 22 UA        | 10.1 A        | 1140 A         | 1 1 UA       | 2 2 UA       | 1100 UV        | 22 UV         | 2 2 UR      | 37 7 V       | 19 7 V    | 3 A       |
| 28             | B200889      | 21.9 UV        | 1450 V         | 112 A         | 11 UV           | 21 9 UA      | 8 8 UR        | 1100 UA        | 1 1 UA       | 2.2 UA       | 1100 UV        | 21 9 UV       | 2 1 UR      | 21 9 UV      | 12 7 V    | 15.8 A    |
| 29             | B200889      | 22.3 UV        | 1440 V         | 446 A         | 11 UV           | 22 3 UA      | 8.9 UA        | 1110 UA        | 1.1 UA       | 2 2 UA       | 1110 UV        | 22.3 UV       | 2 2 UR      | 22 3 UV      | 20 3 V    | 13 3 A    |
| 30             | B200889      | 25.5 UV        | 2110 A         | 216           | 13 UV           | 25 5 UV      | 10 2 UA       | 2300 V         | 1 3 UA       | 2.6 UV       | 1280 UV        | 25 5 UV       | 2 5 UA      | 58 5 V       | 36 3 V    | 36 1 A    |
| 31             | B200989      | 31.3 V         | 5570 V         | 255 A         | 14 UV           | 28.9 A       | 52 1 A        | 3830 V         | 1 4 UR       | 3 9 A        | 1360 UV        | 52 4 V        | 2 7 UA      | 27 3 UV      | 64 2 V    | 56 8 V    |
| 32             | B200989      | 21.4 UV        | 4090 V         | 90 6 A        | .11 UV          | 21 4 UV      | 21 6 V        | 1850 V         | 1 1 UR       | 2 1 UA       | 1070 UV        | 71 8 V        | 2 2 UA      | 21.4 UR      | 10 7 UV   | 13 6 V    |
| 33             | B200989      | 20 7 UV        | 1980 V         | 79.7 A        | .11 UV          | 20.7 UV      | 15 2 A        | 1030 UV        | 1 1 UR       | 2 1 UA       | 1030 UV        | 25.2 V        | 2 2 UA      | 20 7 UR      | 10 3 UV   | 4 9 V     |
| 34             | B200989      | 21.9 UV        | 1770 V         | 195 A         | .11 UA          | 21 9 UV      | 15 6 V        | 1090 UV        | 1 1 UR       | 2 2 UA       | 1090 UV        | 21.9 UV       | 2 2 UA      | 21 9 UA      | 18 1 V    | 16 8 V    |
| 35             | B200989      | 24 UV          | 2410 V         | 125 A         | .12 UV          | 24 UV        | 16.2 A        | 1280 V         | 1 2 UR       | 2.4 UA       | 1200 UV        | 24 UV         | 2.4 UA      | 24 UA        | 17 9 V    | 21 8 A    |
| 36             | B200989      | 23 4 UV        | 2650 A         | 197           | 12 UV           | 23 6 A       | 15.4 A        | 1990 V         | 1 2 UV       | 2 3 UV       | 1170 UV        | 29.4 A        | 2 3 UA      | 32 4 A       | 42 3 V    | 40 4 A    |
| 37             | B201089      | 23 5 UV        | 5480 V         | 145 A         | 12 UV           | 23 5 UV      | 36 2 V        | 2180 V         | 5 9 UR       | 2.5 A        | 1180 UV        | 47 1 V        | 2 4 UA      | 23 5 UV      | 31 3 V    | 39 1 V    |

U=Analyzed but not detected      J=Present below detection limit      E=Estimated value      =Missing  
A=Acceptable with qualifications      V=Valid and acceptable      R=Rejected      Qtr=Quarter

Total Metal Concentrations for 1989 Background Borehole Stations  
(Concentration units mg/kg)

| Station Number | Date Sampled | Qtr      | Depth  | Aluminum (Al) | Antimony (Sb) | Arsenic (As) | Barium (Ba) | Beryllium (Be) | Cadmium (Cd) | Calcium (Ca) | Cesium (Cs) | Chromium (Cr) | Cobalt (Co) | Copper (Cu) | Iron (Fe) | Lead (Pb) |
|----------------|--------------|----------|--------|---------------|---------------|--------------|-------------|----------------|--------------|--------------|-------------|---------------|-------------|-------------|-----------|-----------|
| 38             | B201089      | 03/02/89 | 1      | 01-06         | 13200 V       | 5 2 A        | 86.9 V      | 7 3 V          | 1.1 UR       | 44300 A      | 223 UV      | 8 3 A         | 11.1 UV     | 13 V        | 12100 V   | 12.8 V    |
| 39             | B201089      | 03/02/89 | 1      | 07-13         | 7400 V        | 10 8 A       | 75.8 V      | 4 V            | 1.2 UA       | 5650 V       | 242 UV      | 6 1 A         | 12 1 UV     | 20 6 V      | 7120 V    | 25 8 V    |
| 40             | B201089      | 03/02/89 | 1      | 13-19         | 5530 V        | 2 4 UA       | 46 9 UV     | 1 9 A          | 1.2 UA       | 5380 V       | 234 UR      | 4.5 A         | 11.7 UV     | 14 V        | 2940 V    | 14 6 V    |
| 41             | B201089      | 03/09/89 | 1      | 00-03         | 22900 V       | 5.2 A        | 101 V       | 5 V            | 1 2 UV       | 4250 A       | 232 UV      | 21.3 V        | 13 V        | 15 6 V      | 19800 V   | 12.2 V    |
| 42             | B201189      | 03/17/89 | 1      | 00-03         | 5860          | 14.1 U       | 73 2        | 2 2            | 1.2 U        | 6050         | 235 U       | 6 1           | 11 8 U      | 11 3        | 6860      | 16        |
| 43             | B201189      | 03/17/89 | 1      | 03-09         | 4630 V        | 6 5 V        | 86 4 V      | 2 A            | 1 2 UV       | 6100 A       | 232 UV      | 7 2 A         | 15 9 V      | 14.2 A      | 10700 V   | 14 7 V    |
| 44             | B201189      | 03/17/89 | 1      | 09-15         | 6960 A        | 2 4 UV       | 114 V       | 2 4 A          | 1 2 UV       | 7040 A       | 239 UV      | 7.9 A         | 12 UV       | 12 4 A      | 11200 V   | 16 8 V    |
| 45             | B201189      | 03/17/89 | 1      | 09-15         | 7520 V        | 2 5 UA       | 56.1 V      | 2.8 A          | 1.2 UV       | 5590 A       | 239 UV      | 8 A           | 11 9 UV     | 11 4 A      | 9980 V    | 15 2 V    |
| 46             | B201189      | 03/17/89 | 1      | 15-21         | 5520 V        | 5 2 V        | 45 4 UV     | 2 1 A          | 1 1 UV       | 5000 A       | 227 UV      | 7.1 A         | 11 3 UV     | 10 9 A      | 8810 V    | 16 6 V    |
| 47             | B201189      | 03/17/89 | 1      | 21-27         | 5540 V        | 2 4 UV       | 124 V       | 2.2 A          | 1 2 UV       | 5580 A       | 239 UV      | 7.2 A         | 12 UV       | 15 3 A      | 7420 V    | 18 5 V    |
| 48             | B201189      | 03/17/89 | 1      | 27-33         | 4850 V        | 2 8 V        | 96 3 V      | 2 1 A          | 1 2 UV       | 4560 A       | 244 UV      | 6 3 A         | 12 2 UV     | 13 A        | 9700 V    | 13 4 V    |
| 49             | B201189      | 03/17/89 | 1      | 27-33         | 4850          | 2 8          | 96 3        | 2 1            | 1 2 U        | 4560         | 244 U       | 6 3           | 12 2 U      | 13          | 9700      | 13 4      |
| 50             | B201189      | 03/23/89 | 1      | 35-41         | 7040 A        | 2 5 UA       | 212 A       | 2 8 A          | 1 3 UA       | 8890 A       | 258 UA      | 10 1 A        | 12 9 UA     | 26 7 A      | 20700 A   | 27.4 A    |
| 38             | B201089      | 22.3 UV  | 4550 V | 82.1 A        | 12 UV         | 22 3 UV      | 24 9 V      | 1540 V         | 5 6 UR       | 2.2 UA       | 1110 UV     | 64 7 V        | 2.2 UA      | 22 3 UR     | 20.3 V    | 29 5 V    |
| 39             | B201089      | 24 2 UV  | 1950 V | 16 A          | 13 UV         | 24.2 UV      | 21 5 V      | 1210 UV        | 1 2 UR       | 2 4 UA       | 1210 UV     | 68 5 V        | 2 4 UA      | 24 2 UR     | 17 4 V    | 50 9 V    |
| 40             | B201089      | 23 4 UV  | 1600 V | 11.6 A        | 12 UA         | 23 4 UV      | 17.3 V      | 1170 UV        | 1 2 UR       | 2.3 UA       | 1170 UV     | 51.8 V        | 2.4 UA      | 23 4 UR     | 19.4 V    | 45.9 V    |
| 41             | B201089      | 16.5 V   | 4510 A | 303 A         | 12 UR         | 13 3 V       | 28 6 A      | 3090 V         | 1 2 UV       | 33.5 A       | 1160 UV     | 30 8 V        | 2 3 A       | 379 V       | 40.9 V    | 43 8 A    |
| 42             | B201189      | 3 82     | 1770   | 237           | 12 U          | 9 1          | 10 9        | 1180 U         | 6 1 U        | 2 4 U        | 1180 U      | 41.6          | 2 4 U       | 23 5 U      | 15 8      | 34 1      |
| 43             | B201189      | 6 2 V    | 1910 V | 281 A         | 12 UV         | 7 A          | 25 1 A      | 1160 UA        | 5 9 UA       | 2 3 UR       | 1160 UV     | 45 V          | 2 3 UA      | 23.2 UR     | 26 V      | 65 V      |
| 44             | B201189      | 5.2 V    | 1820 V | 141 A         | 1 UV          | 8 7 A        | 10 6 A      | 1200 UA        | 6 UA         | 2 4 UR       | 1200 UV     | 54 4 V        | 2.4 UA      | 23 9 UR     | 20 3 V    | 44.3 V    |
| 45             | B201189      | 5 8 V    | 1920 V | 94.7 A        | .12 UV        | 11.7 A       | 9 9 A       | 1190 UV        | 6 2 UA       | 2 4 UA       | 1190 UV     | 50 3 V        | 2 5 UA      | 23 9 UR     | 21 8 V    | 39 6 V    |
| 46             | B201189      | 5 6 V    | 1850 V | 149 A         | 11 UV         | 9 6 A        | 14 8 A      | 1130 UA        | 5 6 UA       | 2 3 UR       | 1130 UV     | 44 V          | 2 2 UR      | 22 7 UR     | 16 V      | 58 9 V    |
| 47             | B201189      | 5 8 V    | 1840 V | 85 5 A        | .12 UV        | 9 7 A        | 10 9 A      | 1200 UV        | 6 UA         | 2 4 UR       | 1200 UV     | 58 5 V        | 2 4 UA      | 23 9 UR     | 23 V      | 67 1 V    |
| 48             | B201189      | 4.7 V    | 1540 V | 98 4 A        | .12 UV        | 7 8 A        | 10 9 A      | 1220 UV        | 1.2 UA       | 2 4 UA       | 1220 UV     | 49 4 V        | 2 5 UA      | 24 4 UR     | 19 6 V    | 56.6 V    |
| 49             | B201189      | 4 7      | 1540   | 98 4          | .12 U         | 7 8          | 10 9        | 1220 U         | 1 2 U        | 2 4 U        | 1220 U      | 49 4          | 2.5 U       | 24 4 U      | 19 6      | 56 6      |
| 50             | B201189      | 7 1 A    | 2320 A | 205 A         | 28 A          | 9 7 A        | 17 4 A      | 1290 UA        | 1.2 UA       | 2 6 UA       | 1290 UA     | 113 A         | 2 5 UA      | 25 8 UA     | 32 1 A    | 99 5 A    |

U=Analyzed but not detected      J=Present below detection limit      E=Estimated value      =Missing  
A=Acceptable with qualifications      V=Valid and acceptable      R=Rejected      Qtr=Quarter

Total Metal Concentrations for 1989 Background Borehole Stations  
(Concentration units mg/kg)

page 5

| Station Number | Date Sampled | Qtr      | Depth  | Aluminum (Al) | Antimony (Sb) | Arsenic (As) | Barium (Ba) | Beryllium (Be) | Cadmium (Cd) | Calcium (Ca) | Cesium (Cs) | Chromium (Cr) | Cobalt (Co) | Copper (Cu) | Iron (Fe) | Lead (Pb) |
|----------------|--------------|----------|--------|---------------|---------------|--------------|-------------|----------------|--------------|--------------|-------------|---------------|-------------|-------------|-----------|-----------|
| 51             | B201189      | 03/23/89 | 1      | 41-46         | 5550 A        | 13.5 UA      | 2.2 UA      | 2.2 UA         | 1.1 UA       | 5190 A       | 225 UA      | 6.9 A         | 11.3 UA     | 21.6 A      | 6850 A    | 28.2 A    |
| 52             | B201289      | 03/22/89 | 1      | 03-07         | 7110 A        | 13.6 UA      | 2.3 UA      | 2.5 A          | 1.1 UA       | 7650 A       | 228 UA      | 17.4 A        | 11.4 UA     | 13.9 A      | 10500 A   | 19.4 A    |
| 53             | B201289      | 03/22/89 | 1      | 09-15         | 6600 A        | 14.1 UA      | 2.4 A       | 2.4 A          | 1.2 UA       | 6680 A       | 236 UA      | 11.4 A        | 11.8 UA     | 12.5 A      | 8660 A    | 16.8 A    |
| 54             | B201289      | 03/22/89 | 1      | 15-21         | 7300 A        | 14.4 UA      | 2.6 A       | 2.6 A          | 1.2 UA       | 6610 A       | 240 UA      | 9.8 A         | 12 UA       | 17.8 A      | 10900 A   | 25.7 A    |
| 55             | B201289      | 03/22/89 | 1      | 15-21         | 7570 A        | 14.5 UA      | 3 A         | 2.9 A          | 1.2 UA       | 6240 A       | 241 UA      | 9.4 A         | 12.1 UA     | 21.8 A      | 18800 A   | 25.2 A    |
| 56             | B201289      | 03/22/89 | 1      | 23-29         | 6310 A        | 13.4 UA      | 2.3 UA      | 2.3 A          | 1.1 UA       | 6420 A       | 223 UA      | 8.8 A         | 11.2 UA     | 15.5 A      | 12600 A   | 18 A      |
| 57             | B201289      | 03/22/89 | 1      | 29-30         | 6920 A        | 13.6 A       | 2.7 A       | 3.1 A          | 1.1 UA       | 8100 A       | 226 UA      | 11.3 A        | 29.7 A      | 20.9 R      | 37800 R   | 23.7 A    |
| 58             | B201289      | 03/22/89 | 1      | 30-32         | 3130 A        | 12.8 UA      | 2.2 UA      | 1.7 A          | 1.1 UA       | 2870 A       | 213 UA      | 4.4 A         | 10.7 UA     | 8.1 A       | 12300 A   | 13.4 A    |
| 59             | B201489      | 03/10/89 | 1      | 03-07         | 8390 V        | 13.1 UA      | 2.4 A       | 2.4 V          | 1.1 UV       | 5270 V       | 219 UV      | 8.5 V         | 11 UV       | 13.1 V      | 9840 V    | 12.5 V    |
| 60             | B201489      | 03/10/89 | 1      | 07-09         | 10300 V       | 13.3 UA      | 2.3 A       | 2.1 V          | 1.1 UV       | 5940 V       | 222 UV      | 10.7 V        | 20.5 V      | 19.6 V      | 7420 V    | 11.2 V    |
| 61             | B201489      | 03/10/89 | 1      | 10-15         | 13900 V       | 13 UR        | 2.1 UA      | 2.6 V          | 1.1 UV       | 4980 V       | 217 UV      | 13.7 V        | 10.8 UV     | 12.4 V      | 10900 V   | 13.8 V    |
| 62             | B201489      | 03/10/89 | 1      | 10-15         | 11300 V       | 12.8 UR      | 2.1 UA      | 2.4 V          | 1.1 UV       | 5340 V       | 213 UV      | 10.6 V        | 10.6 UV     | 13 V        | 9790 V    | 13.9 V    |
| 51             | B201189      | 6.1 A    | 1760 A | 45.8 A        | .35 A         | 10 A         | 16.1 A      | 1130 UA        | 1.1 UA       | 2.3 UA       | 1130 UA     | 89.2 A        | 2.2 UA      | 22.5 UA     | 20.5 A    | 74.9 A    |
| 52             | B201289      | 5.8 A    | 2350 A | 128 A         | .21 A         | 11.7 A       | 14.1 A      | 1140 UA        | 5.7 UA       | 2.3 UA       | 1140 UA     | 51.8 A        | 2.3 UA      | 22.8 UA     | 25.7 A    | 41.2 A    |
| 53             | B201289      | 6.5 A    | 2430 A | 115 A         | 27 A          | 10.2 A       | 11.8 A      | 1180 UA        | 5.7 UA       | 2.4 UA       | 1180 UA     | 50 A          | 2.3 UA      | 23.6 UA     | 35.8 A    | 35.8 A    |
| 54             | B201289      | 7.1 A    | 2270 A | 161 A         | 44 A          | 11.3 A       | 9.6 UA      | 1200 UA        | 6.1 UA       | 2.4 UA       | 1200 UA     | 71.5 A        | 2.4 UA      | 24 UA       | 74.9 A    | 74.9 A    |
| 55             | B201289      | 7 A      | 2250 A | 237 A         | .22 A         | 10.4 A       | 18.3 A      | 1210 UA        | 5.9 UA       | 2.4 UA       | 1210 UA     | 71.5 A        | 2.4 UA      | 24.1 UA     | 129 A     | 129 A     |
| 56             | B201289      | 6.3 A    | 2020 A | 127 A         | 31 A          | 9.8 A        | 13.8 A      | 1120 UA        | 5.8 UA       | 2.2 UA       | 1120 UA     | 81 A          | 2.3 UA      | 22.3 UA     | 59.5 A    | 59.5 A    |
| 57             | B201289      | 8.1 A    | 2750 A | 524 A         | 3 A           | 3 A          | 62.4 A      | 1130 UA        | 1.1 UA       | 2.3 UR       | 1130 UA     | 96.3 A        | 2.3 UA      | 22.6 UA     | 76.6 A    | 76.6 A    |
| 58             | B201289      | 5.8 A    | 1290 A | 107 A         | 27 A          | 5.9 A        | 10.6 A      | 1070 UA        | 5.4 UA       | 2.1 UA       | 1070 UA     | 62.3 A        | 2.2 UA      | 21.3 UA     | 38.1 A    | 38.1 A    |
| 59             | B201489      | 6.6 V    | 2470 V | 62.2 A        | 11 UV         | 2.2 UV       | 9.6 A       | 1100 UV        | 1.1 UA       | 16.4 V       | 1100 UA     | 40.8 V        | 2.1 UA      | 285 V       | 15.3 V    | 37.2 V    |
| 60             | B201489      | 7 V      | 2520 V | 305 A         | .11 UV        | 4.3 V        | 14.3 A      | 1110 UV        | 1.1 UA       | 12.7 V       | 1110 UA     | 69.2 V        | 2.2 UA      | 268 V       | 22.2 V    | 79.9 V    |
| 61             | B201489      | 10.4 V   | 2700 V | 54.8 A        | 11 UV         | 5.1 V        | 10.2 A      | 1400 V         | 1.1 UA       | 18.7 V       | 1080 UA     | 53.8 V        | 2.1 UA      | 274 V       | 22.3 V    | 64.3 V    |
| 62             | B201489      | 8.3 V    | 2350 V | 53.1 A        | 11 UV         | 2.1 UV       | 8.5 UA      | 1060 V         | 1.1 UA       | 16.8 V       | 1060 UA     | 63.1 V        | 2.1 UA      | 201 V       | 16.5 V    | 36.1 V    |

U=Analyzed but not detected J=Present below detection limit E=Estimated value  
A=Acceptable with qualifications V=Valid and acceptable R=Rejected Qtr=Quarter

Total Metal Concentrations for 1989 Background Borehole Stations  
(Concentration units mg/kg)

page 6

| Station Number | Date Sampled | Qtr      | Depth   | Aluminum (Al) | Antimony (Sb) | Arsenic (As) | Barium (Ba) | Beryllium (Be) | Cadmium (Cd) | Calcium (Ca) | Cesium (Cs) | Chromium (Cr) | Cobalt (Co) | Copper (Cu) | Iron (Fe) | Lead (Pb) |
|----------------|--------------|----------|---------|---------------|---------------|--------------|-------------|----------------|--------------|--------------|-------------|---------------|-------------|-------------|-----------|-----------|
| 63             | B201489      | 03/10/89 | 1       | 15-19         | 6960 V        | 12.7 UR      | 2 2 UA      | 96 2 A         | 2 V          | 1 1 UV       | 4550 V      | 212 UV        | 6 9 V       | 10.6 UV     | 8790 V    | 13.6 V    |
| 64             | B201589      | 03/15/89 | 1       | 00-03         | 9840          | 13.3 U       | 2 3 U       | 86.3           | 1 1 U        | 3830         | 221 U       | 9 4           | 11 U        | 16.1        | 17300     | 11.6      |
| 65             | B201589      | 03/15/89 | 1       | 03-07         | 8230 V        | 14.3 UA      | 2 3 UV      | 60 9 V         | 2 1 V        | 5630 A       | 238 UV      | 7.4 V         | 11.9 UV     | 10 V        | 9060 V    | 14.8 V    |
| 66             | B201589      | 03/16/89 | 1       | 14-17         | 3160 V        | 12.7 UA      | 2 2 UA      | 47 9 V         | 1.2 A        | 3470 V       | 212 UV      | 3 A           | 10 6 UV     | 6 5 A       | 3430 V    | 18.2 V    |
| 67             | B201589      | 03/16/89 | 1       | 17-20         | 2470 V        | 14.4 UA      | 3.6 A       | 47.9 UV        | 1.2 UA       | 2310 V       | 239 UV      | 3 9 A         | 12 UV       | 6 UA        | 3040 V    | 9.4 V     |
| 68             | B302089      | 03/28/89 | 1       | 00-03         | 17800         | 14.5 U       | 5 1         | 313            | 5.5          | 25900        | 241 U       | 21.6          | 12 U        | 14.2        | 20800     | 15.7      |
| 69             | B302089      | 03/28/89 | 1       | 03-06         | 9770 V        | 13.5 UA      | 2 3 UA      | 94 7 V         | 3.5 A        | 11700 V      | 225 UR      | 14.2 V        | 11 3 UV     | 9.2 A       | 13200 V   | 17.6 A    |
| 70             | B302089      | 03/28/89 | 1       | 13-19         | 6420 V        | 16.2 A       | 3.4 A       | 62 V           | 2 7 A        | 4140 V       | 230 UR      | 8 9 V         | 15.3 V      | 14.6 A      | 38100 V   | 22.4      |
| 71             | B302089      | 03/28/89 | 1       | 13-19         | 8810 V        | 14 UA        | 5 2 A       | 77.7 V         | 3.2 A        | 4490 V       | 234 UR      | 11 7 V        | 11 7 UV     | 19.8 A      | 23800 V   | 21.5 A    |
| 72             | B302089      | 03/28/89 | 1       | 19-25         | 6290 V        | 13.6 UA      | 8 A         | 105 V          | 2.3 A        | 3120 V       | 226 UR      | 8 5 V         | 11 3 UV     | 12.2 A      | 6930 V    | 15.6 A    |
| 73             | B400189      | 03/09/89 | 1       | 00-03         | 20000         | 12.8 U       | 3 9         | 61.2           | 4.5          | 2330         | 214 U       | 23.1          | 10.7 U      | 6.9         | 15900     | 12.7      |
| 63             | B201489      | 9 2 V    | 2060 V  | 74 1 A        | .11 UV        | 2.1 UV       | 8 5 UA      | 1060 UV        | 1.1 UA       | 14.9 V       | 1060 UA     | 41.1 V        | 2 2 UA      | 190 V       | 11 V      | 47.7 V    |
| 64             | B201589      | 22 1 U   | 3210    | 231           | .11 U         | 22.1 U       | 19 2        | 1790           | 1.1 U        | 2.2 U        | 301         | 25.1          | 2 3 U       | 441         | 22 3      | 50        |
| 65             | B201589      | 4.8 V    | 2200 A  | 103           | 11 UV         | 3.5 V        | 11 9 V      | 1190 UV        | 1.2 UA       | 15.2 V       | 1190 UA     | 38.4 V        | 2.3 UA      | 382 A       | 11.9 UV   | 28.3 A    |
| 66             | B201589      | 2 1 UV   | 1060 UV | 34 7 V        | 11 UV         | 6.6 V        | 8.5 UR      | 1060 UA        | 5.5 UA       | 2.1 UV       | 1060 UV     | 29.7 V        | 2.2 UA      | 21 2 UV     | 10 6 UV   | 24.1 V    |
| 67             | B201589      | 2 6 V    | 1200 UV | 14 9 A        | .12 UV        | 6.9 V        | 9 6 UR      | 1200 UA        | 6.1 UA       | 2 4 UV       | 1200 UV     | 23.9 UV       | 2 4 UA      | 23.9 UV     | 12 UV     | 51.8 V    |
| 68             | B302089      | 16.8     | 5580    | 260           | 098 U         | 22 U         | 20.4        | 1730           | 1 2 U        | 2 4 U        | 3680        | 121           | 2 4 U       | 24 1 U      | 58.8      | 63.3      |
| 69             | B302089      | 12.2 V   | 3680 V  | 115 A         | 097 UV        | 13.9 A       | 15.3 A      | 1130 UV        | 5.7 UA       | 2.3 UV       | 1130 UV     | 110 A         | 2 3 UV      | 22.5 UV     | 27.2 V    | 46.9 V    |
| 70             | B302089      | 6.5 V    | 2090 V  | 367 A         | .12 UV        | 4.2 A        | 31.1 A      | 1150 UV        | 1.2 UA       | 2 3 UV       | 1150 UV     | 94.2 A        | 2 3 UV      | 23 UV       | 37.7 V    | 78.2 V    |
| 71             | B302089      | 6 V      | 2270 V  | 199 A         | 12 V          | 11.2 A       | 18.2 A      | 1170 UV        | 1.2 UA       | 2 3 UV       | 1170 UV     | 90.2 A        | 2.3 UV      | 23.4 UV     | 38.1 V    | 133 V     |
| 72             | B302089      | 5 3 V    | 1680 V  | 164 A         | 11 UV         | 12.1 A       | 9 UA        | 1130 UV        | 1.1 UA       | 2 3 UV       | 1130 UV     | 74.4 A        | 2.2 UV      | 22.6 UV     | 15.1 V    | 56.7 V    |
| 73             | B400189      | 7 64     | 1680    | 39 9          | .11 U         | 13.2         | 20.2        | 1070 U         | 1.1 U        | 27.2         | 1070 U      | 21.4 U        | 2 1 U       | 296         | 43.7      | 17.8      |

U=Analyzed but not detected J=Present below detection limit E=Estimated value  
A=Acceptable with qualifications V=Valid and acceptable R=Rejected Qtr=Quarter

Total Metal Concentrations for 1989 Background Borehole Stations  
(Concentration units mg/kg)

page 7

| Station Number | Date Sampled | Qtr            | Depth          | Aluminum (Al) | Antimony (Sb)   | Arsenic (As) | Barium (Ba)   | Beryllium (Be) | Cadmium (Cd) | Calcium (Ca) | Cesium (Cs)    | Chromium (Cr) | Cobalt (Co) | Copper (Cu)  | Iron (Fe) | Lead (Pb) |
|----------------|--------------|----------------|----------------|---------------|-----------------|--------------|---------------|----------------|--------------|--------------|----------------|---------------|-------------|--------------|-----------|-----------|
| 74             | B400189      | 03/09/89       | 1              | 03-09         | 12100           | 12.8 U       | 3.5           | 42.7 U         | 2 38         | 1.1 U        | 1300           | 15.5          | 10.7 U      | 5.6          | 8860      | 5         |
| 75             | B400189      | 03/09/89       | 1              | 09-15         | 23900           | 13.2 U       | 4.3           | 116            | 5 4          | 1.1 U        | 3350           | 31.7          | 11.3 U      | 25.1         | 20700     | 4.9       |
| 76             | B400189      | 03/09/89       | 1              | 15-21         | 11900           | 12.9 U       | 1.2           | 68.8           | 2 6          | 1.1 U        | 1400           | 26.1          | 10.7 U      | 11.9         | 10200     | 3.9       |
| 77             | B400189      | 03/09/89       | 1              | 21-27         | 13400           | 13.4 U       | 2.2           | 61.7           | 2 9          | 1.1 U        | 1600           | 17.2          | 11.1 U      | 15.1         | 11800     | 4         |
| 78             | B400189      | 03/10/89       | 1              | 30-36         | 11900           | 13 U         | 3             | 83.2           | 3            | 1.1 U        | 3100           | 11.7          | 10.9 U      | 7.1          | 12800     | 7.9       |
| 79             | B400189      | 03/10/89       | 1              | 36-38         | 20000           | 12.6 U       | 2.1 U         | 68.6           | 4 98         | 1 U          | 4620           | 18.8          | 10.5 U      | 11.7         | 20100     | 10.3      |
| 80             | B400189      | 03/10/89       | 1              | 38-44         | 9950            | 12.2 U       | 2.7           | 44.9           | 3 2          | 1 U          | 2030           | 21.2          | 10.1 U      | 11.3         | 13800     | 4.2 U     |
| 81             | B400189      | 03/10/89       | 1              | 44-48         | 10300           | 13.1 U       | 5.3           | 59.8           | 3 3          | 1.1 U        | 2330           | 21.1          | 10.9 U      | 14.6         | 14200     | 7.4       |
| 82             | B400289      | 04/12/89       | 2              | 00-03         | 10200 V         | 13.8 UA      | 7.3 V         | 45.9 UV        | 2 5 A        | 1.1 UR       | 1700 V         | 12.3 V        | 11.5 UV     | 5.7 UA       | 11000 V   | 13 A      |
| 83             | B400289      | 04/12/89       | 2              | 00-03         | 10200           | 13.8 U       | 7.3           | 45.9 U         | 2 5          | 1.1 U        | 1700           | 12.3          | 11.5 U      | 5.7 U        | 11000     | 13        |
| 84             | B400289      | 04/12/89       | 2              | 03-09         | 16600 V         | 12.9 UA      | 9.4 V         | 68.9 V         | 4 1 A        | 1.1 UR       | 3240 V         | 16.8 V        | 10.8 UV     | 5.4 UA       | 11800 V   | 9.7 A     |
| 85             | B400289      | 04/12/89       | 2              | 09-15         | 20400 V         | 13.1 UV      | 4.8 V         | 81.7 V         | 4 6 A        | 1.1 UR       | 2440 V         | 14.9 V        | 10.9 UV     | 9.3 A        | 10900 V   | 8.9 A     |
| 86             | B400289      | 04/13/89       | 2              | 15-21         | 12300 V         | 2.1 UA       | 1.7 A         | 46.4 V         | 2 8 A        | 18 UA        | 1800 V         | 11.7 A        | 3.5 A       | 5.7 A        | 8330 A    | 6.6 A     |
| Station Number | Lithium (Li) | Magnesium (Mg) | Manganese (Mn) | Mercury (Hg)  | Molybdenum (Mo) | Nickel (Ni)  | Potassium (K) | Selenium (Se)  | Silver (Ag)  | Sodium (Na)  | Strontium (Sr) | Thallium (Tl) | Tin (Sn)    | Vanadium (V) | Zinc (Zn) |           |
| 74             | B400189      | 5.5            | 1380           | 104           | .11 U           | 7.7          | 8.8           | 1070 U         | 5.3 U        | 15.2         | 21.3 U         | 2.1 U         | 317         | 22.8         | 11.2      |           |
| 75             | B400189      | 15.5           | 4170           | 377           | 11 U            | 13.5         | 29.5          | 1100 U         | 5.5 U        | 35.2         | 22.1 U         | 2.2 U         | 332         | 50.7         | 39        |           |
| 76             | B400189      | 7.9            | 1950           | 199           | 11 U            | 8.54         | 10            | 1550           | 5.3 U        | 17.2         | 21.5 U         | 2.1 U         | 333         | 19.9         | 21.1      |           |
| 77             | B400189      | 7.8            | 2000           | 163           | 11 U            | 9.1          | 10            | 1110 U         | 5.5 U        | 20           | 22.3 U         | 2.2 U         | 338         | 27.7         | 22.8      |           |
| 78             | B400189      | 6.44           | 2320           | 259           | .11 U           | 2.2 U        | 10.5          | 1100           | 5.1 U        | 21.6         | 21.7 U         | 2.1 U         | 188         | 24.2         | 19.6      |           |
| 79             | B400189      | 8.8            | 3500           | 121           | 11 U            | 2.1 U        | 18.8          | 2100           | 1.1 U        | 34.2         | 26.4           | 2.1 U         | 188         | 42.7         | 28.2      |           |
| 80             | B400189      | 6.94           | 2210           | 112           | 11 U            | 2 U          | 12            | 1390           | 1 U          | 23.4         | 20.3 U         | 2.1 U         | 204         | 27           | 20.7      |           |
| 81             | B400189      | 9.04           | 2610           | 172           | 11 U            | 8.8          | 17.9          | 1550           | 5.5 U        | 24.6         | 21.8 U         | 2.2 U         | 306         | 24.7         | 32.2      |           |
| 82             | B400289      | 3.7 V          | 1150 UV        | 38 V          | .2 V            | 5.9 A        | 14.6 A        | 1150 UA        | 5.8 UA       | 2.3 UR       | 23 UV          | 2.3 UV        | 23 UV       | 36.3 V       | 16.2 A    |           |
| 83             | B400289      | 3.7            | 1150 U         | 38            | 2               | 5.9          | 14.6          | 1150 U         | 5.8 U        | 2.3 U        | 23 U           | 2.3 U         | 23 U        | 36.3         | 16.2      |           |
| 84             | B400289      | 6.1 V          | 1850 V         | 37 V          | .36 V           | 12.6 V       | 17.8 A        | 1080 UA        | 1.1 UA       | 2.2 UR       | 21.6 UV        | 2.1 UV        | 21.6 UV     | 32.4 V       | 24.2 V    |           |
| 85             | B400289      | 9.9 V          | 2350 V         | 168 V         | 13 V            | 15.7 V       | 16.4 A        | 1950 A         | 5.6 UA       | 2.2 UR       | 21.9 UV        | 2.2 UA        | 21.9 UV     | 25.9 V       | 25 V      |           |
| 86             | B400289      | 22.4 UV        | 1470 V         | 2.6 A         | .47 A           | 22.4 UV      | 5.1 A         | 981 A          | 22 UA        | 54 UA        | 224 UV         | 33 UV         | 22.5 UV     | 17.1 V       | 21.1 V    |           |

U=Analyzed but not detected J=Present below detection limit E=Estimated value  
A=Acceptable with qualifications V=Valid and acceptable R=Rejected qtr=Quarter

Total Metal Concentrations for 1989 Background Borehole Stations  
(Concentration units mg/kg)

page 8

| Station Number | Date Sampled | Qtr      | Depth | Aluminum (Al) | Antimony (Sb) | Arsenic (As) | Barium (Ba) | Beryllium (Be) | Cadmium (Cd) | Calcium (Ca) | Cesium (Cs) | Chromium (Cr) | Cobalt (Co) | Copper (Cu) | Iron (Fe) | Lead (Pb) |
|----------------|--------------|----------|-------|---------------|---------------|--------------|-------------|----------------|--------------|--------------|-------------|---------------|-------------|-------------|-----------|-----------|
| 87             | B400289      | 04/13/89 | 2     | 21-30         | 11000 V       | 13.4 UA      | 53.3 V      | 2.6 A          | 1.1 UA       | 1900 V       | 223 UV      | 9.3 A         | 11.1 UA     | 8.1 A       | 9350 A    | 10.5 A    |
| 88             | B400289      | 04/14/89 | 2     | 30-36         | 12600         | 13.6 U       | 74.5        | 2.9            | 1.1 U        | 2840         | 226 U       | 14.6          | 11.3 U      | 13.7        | 13300     | 5.2       |
| 89             | B400289      | 04/14/89 | 2     | 36-42         | 8430 V        | 13.4 UA      | 60.6 V      | 2.1 A          | 1.1 UA       | 3300 V       | 223 UV      | 17.4 A        | 11.1 UA     | 11.9 A      | 10400 A   | 14.4 A    |
| 90             | B400289      | 04/17/89 | 2     | 42-48         | 8604 V        | 14.3 UV      | 65.3 V      | 2. A           | 1.2 UA       | 2196 V       | 238 UV      | 14.8 V        | 11.9 UV     | 10.3 A      | 11100 V   | 3.3 V     |
| 91             | B400389      | 04/25/89 | 2     | 00-03         | 6970 V        | 12.1 UR      | 40.4 UV     | 1.5 V          | 1 UR         | 1210 V       | 202 UV      | 13.8 V        | 14.3 V      | 31.6 V      | 7750 V    | 5.9 V     |
| 92             | B400389      | 04/25/89 | 2     | 03-09         | 8970 V        | 12.4 UR      | 41.2 UV     | 2.3 V          | 1 UV         | 8040 V       | 206 UV      | 10.5 V        | 10.3 UV     | 8.7 A       | 8700 V    | 4.2 A     |
| 93             | B400389      | 04/25/89 | 2     | 03-09         | 9040 V        | 12.7 UR      | 42.3 UV     | 2.4 V          | 1.1 UR       | 9520 V       | 212 UV      | 16.5 V        | 10.6 UV     | 9.3 A       | 9710 V    | 5.1 V     |
| 94             | B400389      | 04/25/89 | 2     | 09-15         | 11800 V       | 12.6 UA      | 60.9 V      | 2.4 V          | 1.1 UV       | 2550 V       | 210 UV      | 18.2 V        | 12.1 V      | 10.7 A      | 10900 V   | 4.9 V     |
| 95             | B400389      | 04/25/89 | 2     | 15-21         | 9920 V        | 12.1 UR      | 56.8 V      | 2.2 V          | 1 UV         | 3160 V       | 202 UV      | 16.1 V        | 10.1 UV     | 7.8 A       | 10700 V   | 4.5 V     |
| 96             | B400389      | 04/25/89 | 2     | 21-27         | 9190 V        | 12.3 UA      | 50.8 V      | 1.9 V          | 1 UR         | 1910 V       | 204 UV      | 21.6 V        | 10.2 UV     | 6.2 A       | 8800 V    | 3.7 V     |
| 97             | B400389      | 04/25/89 | 2     | 27-33         | 7200 V        | 12.4 UR      | 56.2 V      | 1.5 V          | 1 UR         | 1270 V       | 207 UV      | 17.8 V        | 11.3 V      | 5.5 A       | 8360 V    | 3.1 V     |
| 98             | B400389      | 04/25/89 | 2     | 33-39         | 9230 V        | 12.6 UA      | 73.1 V      | 2 V            | 1.1 UR       | 3060 V       | 210 UV      | 17.7 V        | 10.5 UV     | 6.5 A       | 10900 V   | 4.7 V     |
| 99             | B400389      | 04/26/89 | 2     | 39-45         | 18500 V       | 14.5 UA      | 159 V       | 4.2 V          | 1.2 UV       | 4870 V       | 241 UV      | 21.6 V        | 13.4 V      | 13.9 V      | 20300 V   | 14.6 V    |

| Station Number | Lithium (Li) | Magnesium (Mg) | Manganese (Mn) | Mercury (Hg) | Molybdenum (Mo) | Nickel (Ni) | Potassium (K) | Selenium (Se) | Silver (Ag) | Sodium (Na) | Strontium (Sr) | Thallium (Tl) | Tin (Sn) | Vanadium (V) | Zinc (Zn) |
|----------------|--------------|----------------|----------------|--------------|-----------------|-------------|---------------|---------------|-------------|-------------|----------------|---------------|----------|--------------|-----------|
| 87             | B400289      | 5.5 V          | 1660 V         | 136 A        | 11 UA           | 7.8 V       | 1540 A        | 1.1 UA        | 2.2 UA      | 1110 UV     | 22.3 UV        | 2.2 UV        | 22.3 UV  | 23.4 V       | 25.1 V    |
| 88             | B400289      | 7.3            | 2800           | 140          | .14             | 8.6         | 1830          | 1.1 U         | 2.3 U       | 1130 U      | 22.6 U         | 2.2 U         | 22.6 U   | 28.8         | 41.8      |
| 89             | B400289      | 6.7 V          | 2700 V         | 189 A        | 12 A            | 4.8 A       | 1170 A        | 1.1 UA        | 2.2 UR      | 1110 UV     | 22.3 UV        | 2.3 UV        | 22.3 UV  | 25.6 V       | 35.4 V    |
| 90             | B400289      | 7 V            | 2724 V         | 280 A        | 11 UA           | 5.7 V       | 1572 V        | 5.7 U         | 2.4 UV      | 1188 UV     | 23.8 UV        | 2.3 UV        | 23.8 UV  | 24 V         | 40.8 A    |
| 91             | B400389      | 2 UV           | 1010 UV        | 26.6 V       | .28 V           | 4.4 V       | 1010 UR       | 1 UA          | 2 UV        | 1010 UV     | 202 UV         | 2.1 UV        | 20.2 UV  | 21.5 A       | 4 UA      |
| 92             | B400389      | 4.1 V          | 1290 V         | 103 V        | .18 V           | 4.2 V       | 1030 UA       | 1.1 UR        | 2.1 UV      | 1030 UV     | 206 UV         | 2.1 UV        | 20.6 UV  | 23 A         | 4.1 UA    |
| 93             | B400389      | 4.1 V          | 1340 V         | 113 V        | .14 A           | 5 V         | 1060 UA       | 5.2 UR        | 2.1 UV      | 1060 UV     | 212 UV         | 2.1 UV        | 21.2 UV  | 25.9 A       | 4.2 UR    |
| 94             | B400389      | 6.7 V          | 1860 V         | 231 V        | .12 A           | 6.1 V       | 1050 UA       | 1 UR          | 2.1 UV      | 1050 UV     | 210 UV         | 2 UV          | 21 UV    | 25.1 A       | 5.4 A     |
| 95             | B400389      | 5.2 V          | 1700 V         | 233 V        | .12 A           | 4.5 V       | 1010 UA       | 5.2 UR        | 2 UV        | 1010 UV     | 202 UV         | 2.1 UA        | 20.2 UV  | 23 A         | 5.1 A     |
| 96             | B400389      | 5.1 V          | 1570 V         | 140 V        | .096 UR         | 5.6 V       | 1020 UA       | 5.2 UR        | 2 UV        | 1020 UV     | 204 UV         | 2.1 UV        | 20.4 UV  | 17.9 A       | 5.7 A     |
| 97             | B400389      | 4 V            | 1230 V         | 91 V         | .11 UR          | 4.6 V       | 1040 UA       | 5.1 UR        | 2.1 UV      | 1040 UV     | 207 UV         | 2 UV          | 20.7 UV  | 16 A         | 4.3 A     |
| 98             | B400389      | 6 V            | 2200 V         | 216 V        | .1 UR           | 4.3 V       | 1170 A        | 1.1 UR        | 2.1 UV      | 1050 UV     | 210 UV         | 2.1 UV        | 21 UV    | 22.8 A       | 12.8 A    |
| 99             | B400389      | 10.4 V         | 4390 V         | 409 V        | 19 V            | 8.1 V       | 2570 V        | 1.2 UR        | 2.9 V       | 1200 UV     | 241 UV         | 2.5 UV        | 24.1 UV  | 43.4 A       | 34.6 A    |

U=Analyzed but not detected J=Present below detection limit E=Estimated value  
A=Acceptable with qualifications V=Valid and acceptable R=Rejected  
.=Missing  
Qtr=Quarter

Total Metal Concentrations for 1989 Background Borehole Stations  
(Concentration units mg/kg)

page 9

| Station Number | Date Sampled | Qtr | Depth | Aluminum (Al) | Antimony (Sb) | Arsenic (As) | Barium (Ba) | Beryllium (Be) | Cadmium (Cd) | Calcium (Ca) | Cesium (Cs) | Chromium (Cr) | Cobalt (Co) | Copper (Cu) | Iron (Fe) | Lead (Pb) |
|----------------|--------------|-----|-------|---------------|---------------|--------------|-------------|----------------|--------------|--------------|-------------|---------------|-------------|-------------|-----------|-----------|
| =====          | =====        | ==  | ===== | =====         | =====         | =====        | =====       | =====          | =====        | =====        | =====       | =====         | =====       | =====       | =====     | =====     |
| 100 B400389    | 04/26/89     | 2   | 45-48 | 8880          | 12.7 U        | 2.9          | 73.2        | 1 8            | 1 1 U        | 2350         | 212 U       | 11.2          | 10.6 U      | 6.6         | 10800     | 6 9       |
| 101 B400489    | 04/28/89     | 2   | 00-03 | 8310 V        | 12 2 UR       | 5.5 V        | 40.7 UV     | 1 9 V          | 1 UR         | 1130 V       | 203 UV      | 25.4 V        | 10.2 UV     | 5 1 UA      | 9730 V    | 4.7 V     |
| 102 B400489    | 04/28/89     | 2   | 03-09 | 12300 V       | 12.9 UA       | 4.2 V        | 50 4 V      | 3 2 V          | 1 1 UR       | 4850 V       | 216 UV      | 28.3 V        | 12 V        | 5 4 UA      | 12700 V   | 5 8 V     |
| 103 B400489    | 04/28/89     | 2   | 09-15 | 10700 V       | 12 4 UA       | 3.1 V        | 51.1 V      | 2 4 V          | 1 UR         | 5490 V       | 208 UV      | 30 6 V        | 10 4 UV     | 5 2 UA      | 11200 V   | 4.5 V     |
| 104 B400489    | 04/28/89     | 2   | 09-15 | 9710 V        | 12.4 UA       | 2.8 V        | 53 1 V      | 2 2 V          | 1 UR         | 6000 V       | 207 UV      | 30 6 V        | 10 4 UV     | 5 2 UA      | 10800 V   | 5 4 V     |
| 105 B400489    | 04/28/89     | 2   | 15-21 | 10200 V       | 12 5 UA       | 2 1 UV       | 73.2 V      | 2 4 V          | 1 UR         | 2530 V       | 208 UV      | 19.9 V        | 10 4 UV     | 6 7 A       | 11100 V   | 8.2 V     |
| 106 B400489    | 04/28/89     | 2   | 21-27 | 10500 V       | 12.7 UA       | 2.4 V        | 71.8 V      | 2 6 V          | 1.1 UR       | 3000 V       | 212 UV      | 18 8 V        | 10.6 UV     | 9 4 A       | 13200 V   | 6 7 V     |
| 107 B400489    | 05/01/89     | 2   | 27-33 | 8790          | 12 7 U        | 2 5          | 85.5        | 2              | 1 1 U        | 2590         | 211 U       | 14.2          | 10 6 U      | 7 1         | 11400     | 5 6       |
| 108 B400489    | 05/01/89     | 2   | 33-35 | 10900 A       | 16.6 UA       | 2.8 UV       | 90.9 V      | 2 9 V          | 1 4 UR       | 3120 A       | 277 UV      | 14.1 V        | 13.8 UV     | 11 8 A      | 13100 V   | 6 V       |
| 109 B400489    | 05/01/89     | 2   | 35-38 | 19000 A       | 29 1 UR       | 4 9 UV       | 148 V       | 5 3 V          | 2 4 UR       | 5380 A       | 484 UV      | 25 7 V        | 24 2 UV     | 22 5 A      | 22000 V   | 10 3 V    |
| 110 B400489    | 05/01/89     | 2   | 38-40 | 10000 A       | 18 1 UR       | 2.9 UV       | 76.6 V      | 2 8 V          | 1 5 UR       | 2730 A       | 302 UA      | 19.2 V        | 15 1 UV     | 12.3 A      | 12300 V   | 6 2 V     |
| 111 B400489    | 05/01/89     | 2   | 40-46 | 3540 A        | 15 UR         | 2 4 UA       | 50.1 UV     | 1.3 UA         | 1 3 UR       | 1350 A       | 250 UA      | 9.2 V         | 12 5 UV     | 6 3 UA      | 5870 V    | 2 6 V     |
| 112 B400489    | 05/01/89     | 2   | 46-52 | 2240 A        | 13 9 UR       | 2.4 UA       | 46.2 UV     | 1.2 UA         | 1 2 UR       | 1160 UA      | 231 UA      | 5.6 V         | 11.6 UV     | 5 8 UA      | 4670 V    | 3 2 V     |

| Station Number | Lithium (Li) | Magnesium (Mg) | Manganese (Mn) | Mercury (Hg) | Molybdenum (Mo) | Nickel (Ni) | Potassium (K) | Selenium (Se) | Silver (Ag) | Sodium (Na) | Strontium (Sr) | Thallium (Tl) | Tin (Sn) | Vanadium (V) | Zinc (Zn) |
|----------------|--------------|----------------|----------------|--------------|-----------------|-------------|---------------|---------------|-------------|-------------|----------------|---------------|----------|--------------|-----------|
| =====          | =====        | =====          | =====          | =====        | =====           | =====       | =====         | =====         | =====       | =====       | =====          | =====         | =====    | =====        | =====     |
| 100 B400389    | 5 8          | 2350           | 243            | 083 U        | 2 5             | 19 2        | 1060 U        | 5 2 U         | 2 1 U       | 1060 U      | 212 U          | 2 1 U         | 21 2 U   | 23 6         | 13 3      |
| 101 B400489    | 3 9 V        | 1020 UV        | 47 8 V         | 11 UR        | 6 1 V           | 37.7 V      | 1020 UA       | 5.1 UA        | 2 UV        | 1020 UV     | 203 UV         | 2.1 UA        | 20.3 UV  | 28.9 A       | 4 1 UR    |
| 102 B400489    | 5 8 V        | 1690 V         | 195 V          | 1 UR         | 7.9 V           | 40 3 V      | 1080 UA       | 5 3 UA        | 2 2 UV      | 1080 UV     | 216 UV         | 2 1 UA        | 21 6 UV  | 33.2 A       | 4 3 UA    |
| 103 B400489    | 6 1 V        | 1670 V         | 197 V          | 1 UR         | 6 7 V           | 30 3 V      | 1040 UA       | 1.1 UA        | 2 1 UV      | 1040 UV     | 208 UV         | 2.1 UA        | 20.8 UV  | 26.3 A       | 4 2 UA    |
| 104 B400489    | 5 6 V        | 1640 V         | 185 V          | 097 UR       | 5 5 V           | 29.2 V      | 1040 UA       | 1.1 UA        | 2 1 UV      | 1040 UV     | 207 UV         | 2 1 UA        | 20 7 UV  | 25.9 A       | 4 1 UA    |
| 105 B400489    | 6 1 V        | 2180 V         | 427 V          | 1 UR         | 6 V             | 30 2 V      | 1330 A        | 1.1 UA        | 2 1 UV      | 1040 UV     | 208 UV         | 2 1 UA        | 20 8 UV  | 24 2 A       | 9 9 A     |
| 106 B400489    | 7 3 V        | 2840 V         | 294 V          | 1 UR         | 5 6 V           | 32.5 V      | 1570 A        | 1 UA          | 2.1 UV      | 1060 U      | 212 UV         | 2 1 UA        | 21 2 UV  | 28.3 A       | 18 1 A    |
| 107 B400489    | 6 7          | 2760           | 488            | 1 U          | 3 9             | 23 9        | 1870          | 5 2 U         | 2 1 U       | 1060 U      | 211 U          | 2 1 U         | 21 1 U   | 22.7         | 16 1      |
| 108 B400489    | 9 V          | 2840 A         | 254 A          | 15 A         | 6 4 V           | 18 3 A      | 2420 A        | 1.4 UR        | 2.8 UA      | 1380 UV     | 277 UV         | 2 8 UV        | 27 7 UV  | 25 7 A       | 34 8 A    |
| 109 B400489    | 15 1 V       | 4910 A         | 460 A          | 24 UR        | 12 3 V          | 33 A        | 4020 A        | 12 2 UR       | 4 8 UA      | 2420 UV     | 484 UV         | 4 9 UV        | 48 4 UV  | 45.6 A       | 64 6 A    |
| 110 B400489    | 8 7 V        | 2700 A         | 219 A          | 12 UR        | 6 9 V           | 26.1 A      | 2060 A        | 1 5 UR        | 3 UA        | 1510 UV     | 302 UV         | 2 9 UV        | 30 2 UV  | 25.5 A       | 29 6 A    |
| 111 B400489    | 5 1 V        | 1480 A         | 105 A          | 1 UR         | 2 5 UV          | 10 UA       | 1250 UA       | 1 2 UR        | 2 8 A       | 1250 UV     | 250 UV         | 2 4 UV        | 25 UV    | 12.6 A       | 18.1 A    |
| 112 B400489    | 3 9 V        | 1180 A         | 89.3 A         | 58 V         | 2 3 UV          | 9 2 UA      | 1160 UA       | 1 2 UR        | 6 6 A       | 1160 UV     | 231 UV         | 2 4 UV        | 23 1 UV  | 11 6 UA      | 15 7 A    |

U=Analyzed but not detected      J=Present below detection limit      E=Estimated value      =Missing  
A=Acceptable with qualifications      V=Valid and acceptable      R=Rejected      Qtr=Quarter

Total Metal Concentrations for 1989 Background Borehole Stations  
(Concentration units mg/kg)

page 10

| Station Number | Date Sampled | Qtr | Depth | Aluminum (Al) | Antimony (Sb) | Arsenic (As) | Barium (Ba) | Beryllium (Be) | Cadmium (Cd) | Calcium (Ca) | Cesium (Cs) | Chromium (Cr) | Cobalt (Co) | Copper (Cu) | Iron (Fe) | Lead (Pb) |
|----------------|--------------|-----|-------|---------------|---------------|--------------|-------------|----------------|--------------|--------------|-------------|---------------|-------------|-------------|-----------|-----------|
| 113 B400489    | 05/01/89     | 2   | 52-54 | 4130 A        | 13.8 UA       | 2.4 UV       | 64.3 V      | 1.4 V          | 1.1 UR       | 1770 A       | 230 UA      | 8.1 V         | 11.5 UV     | 7.6 A       | 8200 V    | 9 V       |
| 114 B401989    | 04/05/89     | 2   | 00-03 | 20800         | 14.5 U        | 4.8          | 491         | 6.2            | 1.2 U        | 25600        | 242 U       | 26.9          | 13.9        | 10.1        | 18100     | 16.8      |
| 115 B401989    | 04/05/89     | 2   | 03-09 | 16100 V       | 15.5 UA       | 3.2 V        | 257 V       | 5.1 V          | 1.3 UR       | 9430 V       | 258 UR      | 25.4 V        | 12.9 UV     | 10.3 V      | 17500 V   | 16.8 A    |
| 116 B401989    | 04/05/89     | 2   | 09-15 | 14900 V       | 14.3 UA       | 2.5 UV       | 129 V       | 4.5 A          | 1.2 UA       | 4770 V       | 238 UR      | 22.2 V        | 11.9 UV     | 15.2 V      | 14000 V   | 14.3 A    |
| 117 B401989    | 04/05/89     | 2   | 15-19 | 8910 V        | 14.3 UA       | 3.4 V        | 58.1 V      | 3 A            | 1.2 UR       | 4160 V       | 238 UR      | 13.9 V        | 11.9 UV     | 6.4 V       | 9990 V    | 6.6 A     |
| 118 B401989    | 04/05/89     | 2   | 21-27 | 9720 V        | 14.6 UA       | 2.5 V        | 110 V       | 2.1 A          | 1.2 UR       | 6020 V       | 243 UR      | 10.6 V        | 12.2 UV     | 23 V        | 14300 V   | 25 A      |
| 119 B401989    | 04/05/89     | 2   | 27-33 | 9150 V        | 15 UV         | 10 V         | 102 V       | 2.2 A          | 1.3 UR       | 5740 V       | 251 UR      | 10.9 V        | 12.5 UV     | 20.8 V      | 12000 V   | 23.6 A    |
| 120 B402189    | 03/29/89     | 1   | 00-03 | 8270 V        | 14.7 UR       | 4.7 A        | 102 V       | 3.2 A          | 1.2 UA       | 4470 V       | 246 UV      | 12.9 V        | 12.3 UV     | 6.1 UA      | 12600 V   | 20.8 A    |
| 121 B402189    | 03/29/89     | 1   | 03-07 | 800 V         | 13.9 UR       | 4.8 A        | 109 V       | 3.9 V          | 1.2 UA       | 11700 V      | 232 UV      | 15.4 V        | 11.6 UV     | 12.1 A      | 13200 V   | 9.6 A     |
| 122 B402189    | 03/29/89     | 1   | 07-13 | 7710          | 14.6 U        | 7            | 162         | 3.1            | 1.2 U        | 6050         | 244 U       | 12            | 12.2 U      | 17.1        | 25300     | 18.3      |
| 123 B402189    | 03/29/89     | 1   | 13-19 | 5440          | 13.8 U        | 3.3          | 93.5        | 2.2            | 1.2 U        | 3570         | 231 U       | 7.5           | 11.5 U      | 8.6         | 7810      | 11.6      |

| Station Number | Lithium (Li) | Magnesium (Mg) | Manganese (Mn) | Mercury (Hg) | Molybdenum (Mo) | Nickel (Ni) | Potassium (K) | Selenium (Se) | Silver (Ag) | Sodium (Na) | Strontium (Sr) | Thallium (Tl) | Tin (Sn) | Vanadium (V) | Zinc (Zn) |
|----------------|--------------|----------------|----------------|--------------|-----------------|-------------|---------------|---------------|-------------|-------------|----------------|---------------|----------|--------------|-----------|
| 113 B400489    | 5.9 V        | 1680 A         | 293 A          | 095 UR       | 2.3 UV          | 10.5 A      | 1150 UA       | 6.1 UR        | 5.8 A       | 1150 UV     | 230 UV         | 2.4 UA        | 23 UV    | 19.1 A       | 26.2 A    |
| 114 B401989    | 18           | 4640           | 97.4           | 12 U         | 26.8            | 20.8        | 1710          | 1.2 U         | 2.4 U       | 1210 U      | 79.6           | 2.4 U         | 24.2 U   | 52.9         | 51.8      |
| 115 B401989    | 14.3 V       | 4320 V         | 76.9 V         | 2 A          | 21.7 V          | 16.2 A      | 1390 V        | 6.4 UV        | 2.6 UR      | 1290 UV     | 83.3 V         | 2.6 UR        | 25.8 UV  | 46.2 V       | 48.3 V    |
| 116 B401989    | 13.1 V       | 3940 V         | 77.4 V         | 13 A         | 20.8 V          | 15.4 A      | 2030 V        | 1.2 UV        | 2.4 UR      | 1190 UV     | 40.8 V         | 2.5 UR        | 23.8 UV  | 37.5 V       | 64.4 V    |
| 117 B401989    | 5.6 V        | 2010 V         | 37 V           | 16 A         | 14.2 V          | 9.5 UA      | 1190 UV       | 5.8 UA        | 2.4 UR      | 1190 UV     | 28.5 V         | 2.3 UR        | 23.8 UV  | 23 V         | 30.4 V    |
| 118 B401989    | 7 V          | 2570 V         | 190 V          | 18 A         | 2.8 A           | 15.1 A      | 1290 V        | 6.1 UA        | 2.4 UR      | 1220 UV     | 67.2 V         | 2.5 UR        | 24.3 UV  | 27.6 V       | 71.9 V    |
| 119 B401989    | 7.3 V        | 2880 V         | 84 V           | 19 A         | 3.7 A           | 32.3 V      | 1350 V        | 1.2 UA        | 2.5 UR      | 1250 UV     | 72.9 V         | 2.4 UR        | 25.1 UV  | 25.1 V       | 82.4 V    |
| 120 B402189    | 6.3 V        | 1840 V         | 75.7 A         | 13 UV        | 12.6 A          | 9.8 UA      | 1250 V        | 1.2 UA        | 2.5 UR      | 1230 UV     | 31.7 V         | 2.4 UR        | 24.6 UV  | 38.6 V       | 23.9 V    |
| 121 B402189    | 8.3 V        | 2740 V         | 91.9 A         | 1 A          | 15.8 A          | 11.9 A      | 1270 V        | 1.1 UA        | 2.3 UR      | 1160 UV     | 41.1 V         | 2.3 UR        | 23.2 UV  | 35.7 V       | 42.6 V    |
| 122 B402189    | 3.3          | 2050           | 737            | 11 U         | 11.5            | 26.2        | 1220 U        | 6.2 U         | 2.4 U       | 1220 U      | 83.3           | 2.5 U         | 24.4 U   | 33.8         | 62.3      |
| 123 B402189    | 3.4          | 1460           | 52.4           | 12           | 11.2            | 9.2 U       | 1150 U        | 1.2 U         | 2.3 U       | 1150 U      | 47.3           | 2.3 U         | 23.1 U   | 15.6         | 41.2      |

U=Analyzed but not detected      J=Present below detection limit      E=Estimated value      =Missing  
A=Acceptable with qualifications      V=Valid and acceptable      R=Rejected      Qtr=Quarter

Inorganic Concentrations for 1989 Background Borehole Stations  
(Concentration units mg/kg except pH)

page 1

| Station Number | Date Sampled | Qtr | Depth | Nitrate/Nitrite |      | pH    | Sulfate |                 |
|----------------|--------------|-----|-------|-----------------|------|-------|---------|-----------------|
|                |              |     |       | as N            | as S |       | pH unit | SO <sub>4</sub> |
| B200589        | 02/22/89     | 1   | 03-08 | 1 1 UV          |      | 6 7   |         |                 |
| B200589        | 02/22/89     | 1   | 03-08 | 1 1 U           |      | 7 4   |         |                 |
| B200589        | 02/22/89     | 1   | 09-13 | 1 1 UV          |      | 7 1   |         |                 |
| B200589        | 02/22/89     | 1   | 13-17 | 1 2 U           |      | 6 2   |         |                 |
| B200589        | 02/22/89     | 1   | 17-23 | 1 1 UV          |      | 7 2   |         |                 |
| B200589        | 02/22/89     | 1   | 23-25 | 1 1 UV          |      | 7 2   |         |                 |
| B200589        | 02/23/89     | 1   | 25-30 | 1 1 UV          |      | 7 8 V |         |                 |
| B200689        | 02/28/89     | 1   | 01-04 | 1 2 UA          |      | 7 3   |         |                 |
| B200689        | 02/28/89     | 1   | 04-10 | 1 1 UA          |      | 7 2   |         |                 |
| B200689        | 02/28/89     | 1   | 10-16 | 1 1 UA          |      | 7 6   |         |                 |
| B200689        | 02/28/89     | 1   | 16-18 | 1 2 UA          |      | 7 6   |         |                 |
| B200689        | 02/28/89     | 1   | 18-24 | 1 1 UA          |      | 7 5   |         |                 |
| B200689        | 02/28/89     | 1   | 24-30 | 1 1 UA          |      | 7 4   |         |                 |
| B200689        | 03/09/89     | 1   | 00-03 | 3 1 V           |      | 7 8   |         |                 |
| B200789        | 03/01/89     | 1   | 01-03 | 1 2 U           |      | 7 4   |         |                 |
| B200789        | 03/01/89     | 1   | 03-06 | 1 1 UV          |      | 8 9   |         |                 |
| B200789        | 03/01/89     | 1   | 06-12 | 1 1 UV          |      | 8 7   |         |                 |
| B200789        | 03/01/89     | 1   | 12-18 | 1 1 UV          |      | 8 5   |         |                 |
| B200789        | 03/01/89     | 1   | 18-24 | 1 2 UV          |      | 8 3   |         |                 |
| B200789        | 03/01/89     | 1   | 24-26 | 1 1 UV          |      | 8 1   |         |                 |
| B200789        | 03/08/89     | 1   | 00-03 | 1 2 UV          |      | 7 7   |         |                 |
| B200889        | 03/06/89     | 1   | 01-06 | 1 2 V           |      | 7 9   |         |                 |
| B200889        | 03/06/89     | 1   | 01-06 | 1 1 UV          |      | 8     |         |                 |
| B200889        | 03/06/89     | 1   | 06-08 | 1 1 UV          |      | 8 7   |         |                 |
| B200889        | 03/06/89     | 1   | 08-14 | 1 1 UV          |      | 8 5   |         |                 |
| B200889        | 03/06/89     | 1   | 14-20 | 1 1 U           |      | 8 3   |         |                 |
| B200889        | 03/06/89     | 1   | 20-22 | 2 5 V           |      | 8 2   |         |                 |
| B200889        | 03/08/89     | 1   | 00-03 | 4 3 V           |      | 7 6   |         |                 |
| B200989        | 03/02/89     | 1   | 10-16 | 1 1 UV          |      | 8 7   |         |                 |
| B200989        | 03/02/89     | 1   | 16-20 | 1 2 UV          |      | 8 3   |         |                 |

U=Analyzed but not detected  
A=Acceptable with qualifications  
J=Present below detection limit  
V=Valid and acceptable  
E=Estimated value  
R=Rejected  
=Missing  
Qtr=Quarter

Inorganic Concentrations for 1989 Background Borehole Stations  
(Concentration units mg/kg except pH)

page 2

| Station<br>Number | Date<br>Sampled | Qtr | Depth | Nitrate/Nitrite<br>as N |  | pH  |      | Sulfate<br>SO <sub>4</sub> |  |
|-------------------|-----------------|-----|-------|-------------------------|--|-----|------|----------------------------|--|
|                   |                 |     |       |                         |  | pH  | unit |                            |  |
| B201089           | 03/02/89        | 1   | 01-06 | 1 1 UV                  |  | 7.8 |      |                            |  |
| B201089           | 03/02/89        | 1   | 01-06 | 1 2 UV                  |  | 8.4 |      |                            |  |
| B201089           | 03/02/89        | 1   | 07-13 | 1 2 UV                  |  | 8.4 |      |                            |  |
| B201089           | 03/02/89        | 1   | 13-19 | 1 2 UV                  |  | 8.4 |      |                            |  |
| B201089           | 03/09/89        | 1   | 00-03 | 1.9 V                   |  | 7.6 |      |                            |  |
| B201189           | 03/17/89        | 1   | 00-03 | 1 2 UV                  |  | 7.5 |      |                            |  |
| B201189           | 03/17/89        | 1   | 03-09 | 1 2 UV                  |  | 7.2 |      |                            |  |
| B201189           | 03/17/89        | 1   | 09-15 | 1 2 UV                  |  | 7.9 |      |                            |  |
| B201189           | 03/17/89        | 1   | 09-15 | 1 2 UV                  |  | 8   |      |                            |  |
| B201189           | 03/17/89        | 1   | 15-21 | 1 2 UV                  |  | 8.3 |      |                            |  |
| B201189           | 03/17/89        | 1   | 21-27 | 1 3 UA                  |  | 8.5 |      |                            |  |
| B201189           | 03/17/89        | 1   | 27-33 | 1 3 UA                  |  | 8.4 |      |                            |  |
| B201189           | 03/23/89        | 1   | 35-41 | 1 4 V                   |  | 9.4 |      |                            |  |
| B201189           | 03/23/89        | 1   | 41-46 | 1 1 UV                  |  | 9.7 |      |                            |  |
| B201289           | 03/22/89        | 1   | 03-07 | 1 5 V                   |  | 8.4 |      |                            |  |
| B201289           | 03/22/89        | 1   | 09-15 | 1 9 V                   |  | 8.7 |      |                            |  |
| B201289           | 03/22/89        | 1   | 15-21 | 2 5 V                   |  | 8.7 |      |                            |  |
| B201289           | 03/22/89        | 1   | 15-21 | 1 9 V                   |  | 8.7 |      |                            |  |
| B201289           | 03/22/89        | 1   | 23-29 | 1 1 V                   |  | 8.7 |      |                            |  |
| B201289           | 03/22/89        | 1   | 29-30 | 1 1 V                   |  | 8.5 |      |                            |  |
| B201289           | 03/22/89        | 1   | 30-32 | 1.2 V                   |  | 8.6 |      |                            |  |
| B201489           | 03/10/89        | 1   | 00-03 | 1 2 UV                  |  | 7.6 |      |                            |  |
| B201489           | 03/10/89        | 1   | 03-07 | 1 1 UV                  |  | 8.4 |      |                            |  |
| B201489           | 03/10/89        | 1   | 07-09 | 1.3 V                   |  | 8.9 |      |                            |  |
| B201489           | 03/10/89        | 1   | 10-15 | 1.1 UV                  |  | 8.9 |      |                            |  |
| B201489           | 03/10/89        | 1   | 10-15 | 1 1 UV                  |  | 8.9 |      |                            |  |
| B201489           | 03/10/89        | 1   | 15-19 | 1 1 UV                  |  | 8.8 |      |                            |  |
| B201589           | 03/15/89        | 1   | 00-03 | 1 2 UV                  |  | 7.9 |      |                            |  |
| B201589           | 03/15/89        | 1   | 03-07 | 1 1 UV                  |  | 8.5 |      |                            |  |
| B201589           | 03/16/89        | 1   | 08-14 | 1 2 UV                  |  | 7.6 |      |                            |  |

U=Analyzed but not detected  
A=Acceptable with qualifications  
J=Present below detection limit  
V=Valid and acceptable  
E=Estimated value  
R=Rejected  
=Missing  
Qtr=Quarter

Inorganic Concentrations for 1989 Background Borehole Stations  
(Concentration units mg/kg except pH)

page 3

| Station<br>Number | Date<br>Sampled | Qtr | Depth | Nitrate/Nitrite |      | pH  | Sulfate |                 |
|-------------------|-----------------|-----|-------|-----------------|------|-----|---------|-----------------|
|                   |                 |     |       | as N            | as S |     | pH unit | SO <sub>4</sub> |
| B201589           | 03/16/89        | 1   | 14-17 | 1.1 UV          |      | 7.6 |         |                 |
| B201589           | 03/16/89        | 1   | 17-20 | 1.1 UV          |      | 9.2 |         |                 |
| B301889           | 03/07/89        | 1   | 00-03 | 3.5 V           |      | 8   |         |                 |
| B301889           | 03/07/89        | 1   | 03-09 | 2 V             |      | 8.5 |         |                 |
| B301889           | 03/07/89        | 1   | 09-15 | 1.2 UV          |      | 8.8 |         |                 |
| B301889           | 03/07/89        | 1   | 15-21 | 1.2 UV          |      | 8.9 |         |                 |
| B301889           | 03/07/89        | 1   | 22-28 | 2 V             |      | 8.2 |         |                 |
| B301889           | 03/07/89        | 1   | 28-34 | 1.4 V           |      | 8.3 |         |                 |
| B302089           | 03/28/89        | 1   | 00-03 | 2 V             |      | 9.1 |         |                 |
| B302089           | 03/28/89        | 1   | 03-06 | 1.1 V           |      | 9   |         |                 |
| B302089           | 03/28/89        | 1   | 13-19 | 1.6 V           |      | 9.1 |         |                 |
| B302089           | 03/28/89        | 1   | 13-19 | 1.2 UV          |      | 9.2 |         |                 |
| B302089           | 03/28/89        | 1   | 19-25 | 1.1 UV          |      | 8.9 |         |                 |
| B400289           | 04/12/89        | 2   | 00-03 | 1.2 V           |      | 6.4 |         |                 |
| B400289           | 04/12/89        | 2   | 03-09 | 1.1 UV          |      | 6.1 |         |                 |
| B400289           | 04/12/89        | 2   | 09-15 | 1.4 V           |      | 6.7 |         |                 |
| B400289           | 04/13/89        | 2   | 15-21 | 1.2 UA          |      | 7.7 |         |                 |
| B400289           | 04/13/89        | 2   | 15-21 | 1.1 UA          |      | 7.6 |         |                 |
| B400289           | 04/13/89        | 2   | 21-30 | 1.1 UA          |      | 7.5 |         |                 |
| B400289           | 04/14/89        | 2   | 30-36 | 1.1 UV          |      | 7.1 |         |                 |
| B400289           | 04/14/89        | 2   | 36-42 | 1.1 UV          |      | 8.8 |         |                 |
| B400289           | 04/17/89        | 2   | 42-48 | 1.1 UA          |      | 7.7 |         |                 |
| B400389           | 04/25/89        | 2   | 00-03 | 1.1 UA          |      | 6.3 |         |                 |
| B400389           | 04/25/89        | 2   | 03-09 | 1.3 A           |      | 7.9 |         |                 |
| B400389           | 04/25/89        | 2   | 03-09 | 1.1 UA          |      | 8.4 |         |                 |
| B400389           | 04/25/89        | 2   | 09-15 | 1.4 A           |      | 8.6 |         |                 |
| B400389           | 04/25/89        | 2   | 15-21 | 1.1 UA          |      | 8.8 |         |                 |
| B400389           | 04/25/89        | 2   | 21-27 | 1.1 UA          |      | 8.8 |         |                 |
| B400389           | 04/25/89        | 2   | 27-33 | 1 UA            |      | 8.6 |         |                 |
| B400389           | 04/25/89        | 2   | 33-39 | 1.1 UA          |      | 8.8 |         |                 |

U=Analyzed but not detected  
A=Acceptable with qualifications  
J=Present below detection limit  
V=Valid and acceptable  
E=Estimated value  
R=Rejected  
=Missing  
Qtr=Quarter

Inorganic Concentrations for 1989 Background Borehole Stations  
(Concentration units mg/kg except pH)

page 4

| Station<br>Number | Date<br>Sampled | Qtr | Depth | Nitrate/Nitrite<br>as N |    | pH   |     | Sulfate<br>SO <sub>4</sub> |  |
|-------------------|-----------------|-----|-------|-------------------------|----|------|-----|----------------------------|--|
|                   |                 |     |       | as N                    |    | unit |     | unit                       |  |
| B400389           | 04/26/89        | 2   | 39-45 | 1.9                     | A  |      | 8.4 |                            |  |
| B400389           | 04/26/89        | 2   | 45-48 | 3.1                     |    |      | 8.5 |                            |  |
| B400489           | 04/28/89        | 2   | 00-03 | 1.1                     | UA |      | 7   |                            |  |
| B400489           | 04/28/89        | 2   | 03-09 | 1.3                     | A  |      | 7.6 |                            |  |
| B400489           | 04/28/89        | 2   | 09-15 | 1.3                     | A  |      | 8.7 |                            |  |
| B400489           | 04/28/89        | 2   | 09-15 | 1.1                     | UA |      | 9   |                            |  |
| B400489           | 04/28/89        | 2   | 15-21 | 1.1                     | UA |      | 8.4 |                            |  |
| B400489           | 04/28/89        | 2   | 21-27 | 1.1                     | UA |      | 8.8 |                            |  |
| B400489           | 05/01/89        | 2   | 27-33 | 1.1                     | UV |      | 8.9 |                            |  |
| B400489           | 05/01/89        | 2   | 33-35 | 1.4                     | UV |      | 8.9 |                            |  |
| B400489           | 05/01/89        | 2   | 35-38 | 2.2                     | UV |      | 8.8 |                            |  |
| B400489           | 05/01/89        | 2   | 38-40 | 1.4                     | UV |      | 8.8 |                            |  |
| B400489           | 05/01/89        | 2   | 40-46 | 3.3                     | V  |      | 9.1 |                            |  |
| B400489           | 05/01/89        | 2   | 46-52 | 1.4                     | V  |      | 8.4 |                            |  |
| B400489           | 05/01/89        | 2   | 52-54 | 1.5                     | V  |      | 8.1 |                            |  |
| B401989           | 04/05/89        | 2   | 00-03 | 1.3                     | V  |      | 7.9 |                            |  |
| B401989           | 04/05/89        | 2   | 03-09 | 3.7                     | V  |      | 8   |                            |  |
| B401989           | 04/05/89        | 2   | 09-15 | 3.4                     | V  |      | 8   |                            |  |
| B401989           | 04/05/89        | 2   | 15-19 | 2.8                     | V  |      | 7.7 |                            |  |
| B401989           | 04/05/89        | 2   | 21-27 | 1.2                     | UV |      | 8.5 |                            |  |
| B401989           | 04/05/89        | 2   | 27-33 | 1.2                     | UV |      | 8.9 |                            |  |
| B402189           | 03/29/89        | 1   | 00-03 | 3                       | V  |      | 7.8 |                            |  |
| B402189           | 03/29/89        | 1   | 03-07 | 1.3                     | V  |      | 8.4 |                            |  |
| B402189           | 03/29/89        | 1   | 07-13 | 1.5                     | V  |      | 8.1 |                            |  |
| B402189           | 03/29/89        | 1   | 13-19 | 1.9                     | V  |      | 8   |                            |  |

U=Analyzed but not detected  
A=Acceptable with qualifications  
J=Present below detection limit  
V=Valid and acceptable  
E=Estimated value  
R=Rejected  
=Missing  
Qtr=Quarter

Total Radiochemical Concentrations for 1989 Background Borehole Stations  
(Concentration units pCi/g except Tritium units pCi/ml)

page 1

| Station Number | Date Sampled | Qtr | Depth | Gross Alpha | Gross Beta | Uranium 233,234 | Uranium 235 | Uranium 238 | Strontium 89,90 | Plutonium 239 | Americium 241 | Cesium 137 | Radium 226 | Radium 228 | Tritium |
|----------------|--------------|-----|-------|-------------|------------|-----------------|-------------|-------------|-----------------|---------------|---------------|------------|------------|------------|---------|
| B200589        | 02/22/89     | 1   | 03-08 | 30±14       | 33±6       | .7±.1           | 0±.1        | 8±.1        | 0±.4            | .01±.03       | 01±.03        | 0±.1       | 8±.1       | 1.8±.2     | 2±.17   |
| B200589        | 02/22/89     | 1   | 03-08 | 42±16       | 22±6       | .6±.2           | 0±.1        | 5±.2        | 0±.4            | 02±.02        | - 01±.02      | 0±.1       | 6±.1       | 1.9±.2     | 08±.16  |
| B200589        | 02/22/89     | 1   | 09-13 | 29±14       | 39±6       | .7±.1           | 0±.1        | 8±.1        | - 1±.8          | 0±.02         | 01±.02        | 0±.1       | 7±.1       | 2±.3       | 3±.17   |
| B200589        | 02/22/89     | 1   | 13-17 | 40±16       | 44±7       | .8±.1           | 0±.1        | 9±.1        | 6±.6            | 0±.02         | 01±.02        | 0±.1       | 8±.1       | 2.2±.3     | 34±.17  |
| B200589        | 02/22/89     | 1   | 17-23 | 20±13       | 28±6       | .5±.1           | 0±.1        | 5±.1        | 6±.6            | - 01±.02      | 01±.02        | 0±.1       | 6±.1       | 1.2±.2     | 11±.16  |
| B200589        | 02/22/89     | 1   | 23-25 | 25±14       | 21±6       | .8±.2           | 0±.1        | 6±.2        | 3±.4            | 01±.03        | 01±.03        | 0±.1       | 6±.1       | 1±.1       | 13±.16  |
| B200589        | 02/23/89     | 1   | 25-30 | 26±14       | 18±5       | .7±.2           | 0±.1        | .6±.2       | - 1±.6          | 01±.02        | 0±.02         | 0±.1       | 6±.1       | 9±.1       | 28±.15  |
| B200689        | 02/28/89     | 1   | 01-04 | 19±12       | 21±6       | .7±.2           | 0±.1        | 8±.2        | 2±.4            | - 01±.02      | - 01±.02      | 0±.1       | 6±.1       | 1.2±.2     | 11±.15  |
| B200689        | 02/28/89     | 1   | 04-10 | 27±13       | 16±6       | .5±.1           | 0±.1        | 3±.1        | - 1±.4          | - 01±.02      | 0±.02         | 0±.1       | 5±.1       | 1±.1       | 17±.15  |
| B200689        | 02/28/89     | 1   | 10-16 | 24±13       | 32±6       | .5±.1           | 0±.1        | 6±.1        | 0±.7            | 01±.02        | 0±.02         | 0±.1       | 6±.1       | 1.3±.3     | 29±.16  |
| B200689        | 02/28/89     | 1   | 16-18 | 34±14       | 27±6       | .7±.2           | 0±.1        | 9±.2        | 0±.7            | 0±.02         | 0±.02         | 0±.1       | 6±.1       | 1.6±.2     | 28±.16  |
| B200689        | 02/28/89     | 1   | 18-24 | 17±12       | 20±6       | .8±.2           | 0±.1        | 7±.2        | - 6±.7          | .01±.02       | - 01±.02      | 0±.1       | 6±.1       | 1.4±.3     | 2±.16   |
| B200689        | 02/28/89     | 1   | 24-30 | 14±11       | 20±6       | .6±.2           | 0±.1        | 7±.2        | - 1±.6          | 0±.02         | - 01±.02      | 0±.1       | 7±.1       | 9±.1       | 21±.16  |
| B200689        | 03/09/89     | 1   | 00-03 | 17±9        | 18±5       | .3±.1           | 0±.1        | 5±.2        | - 2±.5          | 0±.02         | - 01±.02      | 1±.1       | 6±.1       | 1.3±.2     | 04±.16  |
| B200789        | 03/01/89     | 1   | 01-03 | 34±14       | 27±6       | .6±.1           | 0±.1        | 6±.1        | - 4±.8          | 01±.02        | 0±.01         | 0±.1       | 7±.1       | 1.7±.3     | 02±.15  |
| B200789        | 03/01/89     | 1   | 03-06 | 19±13       | 25±6       | .5±.1           | 0±.1        | .6±.1       | 0±.6            | 0±.02         | 0±.01         | 0±.1       | 6±.1       | 1.2±.2     | 14±.15  |
| B200789        | 03/01/89     | 1   | 06-12 | 30±13       | 37±6       | .4±.1           | 0±.1        | 4±.1        | - 6±.8          | 01±.02        | 0±.04         | 0±.1       | 6±.1       | 1.3±.3     | 34±.16  |
| B200789        | 03/01/89     | 1   | 12-18 | 30±13       | 21±6       | .5±.1           | 0±.1        | 3±.1        | - 3±.5          | 02±.02        | 0±.01         | 0±.1       | 5±.1       | 1.4±.2     | 35±.16  |
| B200789        | 03/01/89     | 1   | 18-24 | 18±11       | 22±6       | .5±.1           | 0±.1        | .7±.1       | - 4±.4          | - 01±.02      | 0±.01         | 0±.1       | 6±.1       | 9±.2       | 32±.16  |
| B200789        | 03/01/89     | 1   | 24-26 | 12±10       | 26±6       | .4±.1           | .1±.1       | 4±.1        | - 4±.7          | 0±.02         | 0±.01         | 0±.1       | 5±.1       | 9±.1       | 44±.16  |
| B200789        | 03/08/89     | 1   | 00-03 | 17±11       | 29±6       | .8±.2           | 0±.1        | .6±.2       | 1±.6            | 01±.02        | - 01±.01      | 1±.1       | 7±.1       | 1.7±.3     | 1±.15   |
| B200889        | 03/06/89     | 1   | 01-06 | 28±13       | 18±5       | .4±.1           | 0±.1        | 4±.1        | 3±.5            | 01±.02        | - 01±.01      | 0±.1       | 5±.1       | 1.2±.2     | 14±.15  |
| B200889        | 03/06/89     | 1   | 01-06 | 19±11       | 12±5       | .4±.1           | 0±.1        | .4±.1       | 2±.5            | 0±.02         | - 01±.01      | 0±.1       | 5±.1       | 1.2±.2     | 12±.15  |
| B200889        | 03/06/89     | 1   | 06-08 | 15±11       | 16±5       | .3±.1           | 0±.1        | 4±.1        | .4±.5           | 0±.02         | 0±.02         | 0±.1       | 6±.1       | 1.1±.1     | 18±.15  |
| B200889        | 03/06/89     | 1   | 08-14 | 25±12       | 27±6       | .5±.1           | 0±.1        | 5±.1        | 1±.4            | 0±.02         | 0±.01         | 0±.1       | 7±.1       | 1.4±.3     | 19±.15  |
| B200889        | 03/06/89     | 1   | 14-20 | 9.1±9.4     | 31±6       | .3±.1           | 0±.1        | .3±.1       | .2±.4           | - 01±.02      | 0±.02         | 0±.1       | 7±.1       | 9±.1       | 17±.15  |
| B200889        | 03/06/89     | 1   | 20-22 | 19±11       | 22±5       | .3±.1           | 0±.1        | 4±.1        | 4±.8            | 01±.02        | 0±.02         | 0±.1       | 6±.1       | 1.3±.2     | 14±.15  |
| B200889        | 03/08/89     | 1   | 00-03 | 27±12       | 14±5       | .7±.2           | 0±.1        | 6±.2        | 0±.5            | 0±.02         | - 01±.01      | 0±.1       | 5±.1       | 1±.2       | 08±.15  |
| B200989        | 03/02/89     | 1   | 01-04 | 34±16       | 28±7       | .4±.1           | 0±.1        | 3±.1        | 2±.5            | 01±.02        |               | 0±.1       |            |            | 16±.15  |
| B200989        | 03/02/89     | 1   | 04-10 | 14±13       | 18±6       | 3.4±.2          | 1±.1        | 3.2±.2      | 2±.4            | 01±.02        |               | 0±.1       |            |            | 33±.15  |
| B200989        | 03/02/89     | 1   | 04-10 | 15±13       | 24±6       | .4±.1           | 0±.1        | 5±.1        | - 3±.5          | 01±.02        |               | 0±.1       |            |            | 3±.15   |

The table format is      concentration ± counting error      Qtr=Quarter      #Missing data

Total Radiochemical Concentrations for 1989 Background Borehole Stations  
(Concentration units pCi/g except Tritium units pCi/ml)

page 2

| Station Number | Date Sampled | Qtr | Depth | Gross Alpha | Gross Beta | Uranium 233,234 | Uranium 235 | Uranium 238 | Strontium 89,90 | Plutonium 239 | Americium 241 | Cesium 137 | Radium 226 | Radium 228 | Tritium  |
|----------------|--------------|-----|-------|-------------|------------|-----------------|-------------|-------------|-----------------|---------------|---------------|------------|------------|------------|----------|
| B200989        | 03/02/89     | 1   | 10-16 | 16±13       | 19±6       | 5±1             | 1±1         | 5±1         | 1±5             | 0±.02         | .             | 0±1        | .          | .          | 37±15    |
| B200989        | 03/02/89     | 1   | 16-20 | 32±15       | 14±6       | 7±1             | 1±1         | 6±1         | 4±5             | - 01±.02      | .             | 0±.1       | .          | .          | .29±15   |
| B201089        | 03/02/89     | 1   | 01-06 | 20±13       | 27±6       | 5±1             | 0±.1        | 7±.1        | 0±.4            | 0±.02         | .             | 0±.1       | .          | .          | 19±14    |
| B201089        | 03/02/89     | 1   | 01-06 | 27±14       | 22±6       | 6±1             | 1±1         | 5±1         | 0±.6            | 02±.02        | .             | 0±1        | .          | .          | 11±14    |
| B201089        | 03/02/89     | 1   | 07-13 | 28±14       | 24±6       | 1±.2            | 3±.1        | 1.1±.2      | - 5±.8          | 01±.02        | .             | 0±1        | .          | .          | 28±14    |
| B201089        | 03/02/89     | 1   | 13-19 | 39±16       | 24±6       | 13±2            | 0±1         | 14±.2       | - 2±.6          | 0±.01         | .             | 0±1        | .          | .          | 05±14    |
| B201089        | 03/09/89     | 1   | 00-03 | 28±11       | 32±6       | 5±2             | 0±.1        | 4±2         | - 1±.8          | 0±.02         | .             | 0±.1       | 7±1        | 17±2       | 18±16    |
| B201189        | 03/17/89     | 1   | 00-03 | 26±14       | 26±6       | 8±2             | 1±1         | 8±2         | 0±.8            | 01±.02        | .             | 0±1        | 1±1        | 11±2       | 11±15    |
| B201189        | 03/17/89     | 1   | 03-09 | 39±16       | 25±6       | 6±1             | 0±1         | 7±.2        | 5±.8            | 0±.01         | .             | 0±.1       | 12±1       | 13±2       | 1±15     |
| B201189        | 03/17/89     | 1   | 09-15 | 47±17       | 23±6       | 5±1             | 1±.1        | 7±2         | 5±.6            | .01±.02       | .             | 0±1        | 11±1       | 14±2       | 08±15    |
| B201189        | 03/17/89     | 1   | 09-15 | 36±16       | 27±6       | 5±1             | 0±1         | 11±2        | - 2±.8          | - 01±.01      | .             | 0±.1       | 11±1       | 14±2       | .08±.15  |
| B201189        | 03/17/89     | 1   | 15-21 | 44±17       | 28±6       | 6±1             | 0±.1        | 9±2         | 5±.7            | 0±.01         | .             | 0±1        | 11±.1      | 15±2       | - 02±.15 |
| B201189        | 03/17/89     | 1   | 21-27 | 38±16       | 24±6       | 1±2             | 1±.1        | 1.2±.3      | 1±.5            | 02±.02        | .             | 0±1        | 12±1       | 11±2       | 0±.15    |
| B201189        | 03/17/89     | 1   | 27-33 | 46±17       | 31±6       | 12±2            | 0±1         | 13±2        | - 6±.8          | 01±.01        | .             | 0±1        | 13±2       | 17±3       | 03±15    |
| B201189        | 03/23/89     | 1   | 35-41 | 24±14       | 32±6       | 15±3            | 2±.1        | 13±3        | 2±.9            | - 01±.02      | .             | 0±1        | 13±1       | 14±2       | 04±.15   |
| B201189        | 03/23/89     | 1   | 41-46 | 46±17       | 25±6       | 17±4            | 0±1         | 14±3        | - 7±.7          | 0±.02         | .             | 0±.1       | 12±1       | 16±2       | - 03±.15 |
| B201289        | 03/22/89     | 1   | 00-03 | 31±12       | 29±6       | 7±2             | 0±1         | 9±2         | 2±.6            | 0±.02         | .             | 0±.1       | 9±1        | 13±2       | - 14±15  |
| B201289        | 03/22/89     | 1   | 03-07 | 27±11       | 25±6       | 5±2             | 0±1         | 1±3         | 2±.8            | 02±.02        | .             | 0±.1       | 9±1        | 14±2       | - 07±16  |
| B201289        | 03/22/89     | 1   | 09-15 | 24±11       | 24±5       | 6±2             | 0±.1        | 9±2         | 8±.7            | 0±.01         | .             | 0±1        | 8±1        | 16±2       | 04±.14   |
| B201289        | 03/22/89     | 1   | 15-21 | 19±10       | 28±6       | 12±2            | 0±1         | 12±2        | 6±.9            | 0±.02         | .             | 0±.1       | 9±1        | 14±2       | - 12±15  |
| B201289        | 03/22/89     | 1   | 15-21 | 25±11       | 28±6       | 9±3             | 0±1         | 13±3        | - 2±.8          | 01±.02        | .             | 0±1        | 11±1       | 11±2       | - 08±15  |
| B201289        | 03/22/89     | 1   | 23-29 | 18±10       | 18±5       | 13±3            | 0±1         | 12±3        | 2±.7            | 0±.01         | .             | 0±1        | 12±1       | 15±2       | 09±21    |
| B201289        | 03/22/89     | 1   | 29-30 | 27±11       | 23±6       | 9±3             | 0±.1        | 9±2         | 5±1.0           | 0±.02         | .             | 0±1        | 11±1       | 14±2       | 05±14    |
| B201289        | 03/22/89     | 1   | 30-32 | 30±11       | 20±5       | 8±3             | 0±.1        | 1±.2        | 4±.6            | 0±.01         | .             | 0±1        | 9±1        | 11±2       | 39±15    |
| B201489        | 03/10/89     | 1   | 00-03 | 40±16       | 29±6       | 5±1             | 0±1         | 7±2         | 0±.5            | 01±.02        | .             | 0±1        | .          | .          | - 03±15  |
| B201489        | 03/10/89     | 1   | 03-07 | 22±14       | 20±6       | 9±2             | 1±.1        | 8±2         | - 4±.5          | 0±.01         | .             | 0±.1       | .          | .          | 09±16    |
| B201489        | 03/10/89     | 1   | 07-09 | 22±14       | 29±6       | 5±1             | 1±.1        | 6±2         | - 3±.5          | 01±.01        | .             | 0±1        | .          | .          | 02±15    |
| B201489        | 03/10/89     | 1   | 10-15 | 22±14       | 30±6       | 8±2             | 1±1         | 1±2         | - 4±.6          | 01±.01        | .             | 0±1        | .          | .          | - 11±15  |
| B201489        | 03/10/89     | 1   | 10-15 | 33±15       | 30±6       | 8±2             | 0±1         | 12±3        | - 8±.9          | 0±.01         | .             | 0±.1       | .          | .          | - 03±15  |
| B201489        | 03/10/89     | 1   | 15-19 | 19±13       | 31±6       | 4±1             | 1±1         | 7±1         | 7±.6            | 01±.01        | .             | 0±1        | .          | .          | - 08±15  |

The table format is      concentration ± counting error      Qtr=Quarter      =Missing data

Total Radiochemical Concentrations for 1989 Background Borehole Stations  
(Concentration units pCi/g except Tritium units pCi/ml)

page 3

| Station Number | Date Sampled | Qtr | Depth | Gross Alpha | Gross Beta | Uranium 233, 234 | Uranium 235 | Uranium 238 | Strontium 89, 90 | Plutonium 239 | Americium 241 | Cesium 137 | Radium 226 | Radium 228 | Tritium |
|----------------|--------------|-----|-------|-------------|------------|------------------|-------------|-------------|------------------|---------------|---------------|------------|------------|------------|---------|
| B201589        | 03/15/89     | 1   | 00-03 | 26±15       | 27±6       | 4±1              | 1±1         | 7±2         | -5±7             | .01±.02       |               | 0±1        |            |            | .23±.16 |
| B201589        | 03/15/89     | 1   | 03-07 | 27±16       | 20±6       | .7±.2            | 0±1         | .9±.2       | -5±6             | 0±.01         |               | 0±1        |            |            | .24±.16 |
| B201589        | 03/16/89     | 1   | 08-14 | 23±15       | 25±6       | 8±.2             | 0±1         | 5±.2        | -2±.6            | 0±.02         |               | 0±1        | 1±1        | 1±.2       | 17±.16  |
| B201589        | 03/16/89     | 1   | 14-17 | 17±14       | 20±6       | 4±.2             | 0±1         | 7±.3        | 0±.6             | -01±.01       |               | 0±1        | .9±.1      | 1±.2       | 18±.16  |
| B201589        | 03/16/89     | 1   | 17-20 | 37±17       | 25±6       | 5±.1             | 0±1         | .8±.2       | -1±.9            | -01±.01       |               | 0±1        | 1±1        | 1±.2       | 01±.15  |
| B301889        | 03/07/89     | 1   | 00-03 | 30±15       | 25±6       | 1±.2             | 1±1         | 1±.2        | -1±.4            | 02±.02        |               | 1±1        | 1±.2       | 1±.2       | .16±.15 |
| B301889        | 03/07/89     | 1   | 03-09 | 24±14       | 29±6       | 9±.2             | 2±1         | 1±.2        | -1±.5            | 0±.02         |               | 0±1        | 1±.2       | 2±.3       | 2±.15   |
| B301889        | 03/07/89     | 1   | 09-15 | 19±13       | 21±6       | 9±.3             | 0±1         | 8±.3        | -5±.5            | 01±.02        |               | 0±1        | 1±1        | 1.5±.2     | 19±.15  |
| B301889        | 03/07/89     | 1   | 15-21 | 24±14       | 26±6       | 1±.2             | 1±1         | 5±.1        | -3±.4            | 0±.02         |               | 0±1        | 1±.1       | 1.3±.2     | 05±.15  |
| B301889        | 03/07/89     | 1   | 22-28 | 30±15       | 23±6       | 9±.2             | 0±1         | .9±.2       | -2±.4            | 01±.02        |               | 0±1        | 1±.1       | 1±.2       | 2±.15   |
| B301889        | 03/07/89     | 1   | 28-34 | 38±16       | 26±6       | .5±.1            | 0±1         | 7±.2        | -3±.4            | .01±.02       |               | 0±1        | 1±1        | 1±.2       | 13±.15  |
| B302089        | 03/28/89     | 1   | 00-03 | 46±18       | 31±6       | 2.6±.5           | 1±1         | 2±.4        | 0±.6             | 0±.02         |               | 0±1        | 1.3±.1     | 1.5±.2     | 1±.15   |
| B302089        | 03/28/89     | 1   | 03-06 | 28±15       | 28±6       | 9±.3             | 0±1         | 9±.3        | -3±.7            | 0±.02         |               | 0±1        | 1±.2       | 1.6±.2     | 0±.15   |
| B302089        | 03/28/89     | 1   | 13-19 | 29±15       | 24±6       | 1.5±.4           | 0±1         | 1±.3        | 1±.6             | 01±.02        |               | 0±1        | 1±.2       | 1.4±.2     | -11±.15 |
| B302089        | 03/28/89     | 1   | 13-19 | 34±16       | 26±6       | 1.3±.3           | 0±1         | 1.4±.3      | 1±.7             | 0±.02         |               | 0±1        | 1.3±.1     | 1.4±.2     | -08±.15 |
| B302089        | 03/28/89     | 1   | 19-25 | 29±15       | 31±6       | 1±.3             | 1±1         | 9±.2        | -.4±.4           | 01±.02        |               | 0±1        | 1±1        | 1.3±.2     | -02±.15 |
| B400289        | 04/12/89     | 2   | 00-03 | 15±12       | 6±5        | 4±.2             | 0±1         | 5±.2        | 1±.5             | 01±.01        |               | 2±1        | 5±.1       | 1.3±.2     | .12±.15 |
| B400289        | 04/12/89     | 2   | 03-09 | 25±14       | 21±6       | .6±.2            | 0±1         | .7±.2       | 1±.6             | 0±.01         |               | 0±1        | 6±.1       | 1.8±.2     | 14±.15  |
| B400289        | 04/12/89     | 2   | 09-15 | 20±3        | 23±6       | .5±.2            | 0±1         | 5±.2        | -.3±.7           | 0±.01         |               | 0±1        | 7±.1       | 1±.1       | .15±.15 |
| B400289        | 04/13/89     | 2   | 15-21 | 17±13       | 28±6       | 8±.2             | 0±1         | 8±.2        | -2±.6            | .01±.01       |               | 0±1        | 6±.1       | 1.4±.2     | 26±.15  |
| B400289        | 04/13/89     | 2   | 15-21 | 36±16       | 32±6       | 7±.2             | 0±1         | 1±.2        | 0±.5             | 0±.01         |               | 0±1        | 8±.1       | 1.4±.2     | 21±.15  |
| B400289        | 04/13/89     | 2   | 21-30 | 18±13       | 24±6       | .7±.2            | 1±1         | 7±.2        | 0±.5             | 0±.01         |               | 0±1        | .5±.1      | 1.2±.2     | 29±.15  |
| B400289        | 04/14/89     | 2   | 30-36 | 33±15       | 28±6       | 2±.2             | 0±1         | 3±.1        | -.2±.6           | 0±.01         |               | 0±1        | .8±.1      | 1.8±.3     | 33±.16  |
| B400289        | 04/14/89     | 2   | 36-42 | 30±15       | 30±6       | 7±.2             | 0±1         | .4±.1       | -3±.5            | 0±.01         |               | 0±1        | 6±.1       | 1.5±.2     | 14±.16  |
| B400289        | 04/17/89     | 2   | 42-48 | 27±14       | 25±6       | .7±.2            | 0±1         | .7±.2       | -.4±.8           | 0±.01         |               | 0±1        | 9±.1       | 1.6±.2     | -15±.15 |
| B400389        | 04/25/89     | 2   | 00-03 | 13±9        | 15±5       | 5±.2             | 0±1         | 5±.2        | -.1±.6           | 0±.01         |               | 0±1        | .5±.1      | 1.2±.1     | 02±.15  |
| B400389        | 04/25/89     | 2   | 03-09 | 18±10       | 22±6       | 1.1±.3           | 1±1         | .7±.2       | .7±.7            | 0±.01         |               | 0±1        | 4±.1       | 1.5±.2     | 11±.15  |
| B400389        | 04/25/89     | 2   | 03-09 | 15±9        | 20±6       | 6±.2             | 0±1         | .8±.2       | 4±.5             | 0±.01         |               | 0±1        | 7±.1       | 1±.2       | 16±.15  |
| B400389        | 04/25/89     | 2   | 09-15 | 18±10       | 20±5       | 6±.2             | 0±1         | 7±.2        | 3±.6             | 0±.01         |               | 0±1        | 5±.1       | 1.4±.2     | 31±.15  |
| B400389        | 04/25/89     | 2   | 15-21 | 33±11       | 31±6       | 4±.1             | 0±1         | 5±.1        | 4±.7             | 0±.01         |               | 0±1        | 7±.1       | 1.6±.2     | 31±.15  |
| B400389        | 04/25/89     | 2   | 21-27 | 16±9        | 19±5       | 4±.2             | 0±1         | .5±.2       | 3±.6             | 0±.01         |               | 0±1        | 6±.1       | 1±.1       | 22±.15  |

The table format is concentration ± counting error Qtr=Quarter =Missing data

Total Radiochemical Concentrations for 1989 Background Borehole Stations  
(Concentration units pCi/g except Tritium units pCi/ml)

page 4

| Station Number | Date Sampled | Qtr | Depth | Gross Alpha | Gross Beta | Uranium 233,234 | Uranium 235 | Uranium 238 | Strontium 89,90 | Plutonium 239 | Americium 241 | Cesium 137 | Radium 226 | Radium 228 | Tritium |
|----------------|--------------|-----|-------|-------------|------------|-----------------|-------------|-------------|-----------------|---------------|---------------|------------|------------|------------|---------|
| B400389        | 04/25/89     | 2   | 27-33 | 21+10       | 22+6       | .6+2            | 0+1         | 5+2         | .3+5            | 0+01          |               | 0+1        | 6+1        | 1 1+2      | .23+15  |
| B400389        | 04/25/89     | 2   | 33-39 | 18+10       | 25+6       | 7+2             | 0+1         | 6+2         | 1 2+1.0         | 0+01          |               | 0+1        | .6+1       | 1 4+2      | .27+15  |
| B400389        | 04/26/89     | 2   | 39-45 | 27+14       | 31+6       | 6+2             | 0+1         | 7+2         | 0+5             | 0+01          |               | 0+1        | 7+1        | 1 7+2      | -.04+14 |
| B400389        | 04/26/89     | 2   | 45-48 | 23+14       | 25+6       | 1+3             | 1+1         | 1 1+3       | .5+7            | 0+01          |               | 0+1        | 9+1        | 1 6+2      | -.08+15 |
| B400489        | 04/28/89     | 2   | 00-03 | 3+7         | 14+5       | 5+2             | 0+1         | 5+1         | -4+6            | 0+01          |               | 0+1        | .6+1       | 1 1+2      | 1+15    |
| B400489        | 04/28/89     | 2   | 03-09 | 14+9        | 20+6       | .2+1            | 0+1         | 2+1         | 8+7             | 0+01          |               | 0+1        | .7+1       | 1 3+2      | .15+15  |
| B400489        | 04/28/89     | 2   | 09-15 | 9+8         | 21+6       | .5+2            | 0+1         | .6+2        | -.2+8           | 0+01          |               | 0+1        | .6+1       | 1 4+2      | .32+15  |
| B400489        | 04/28/89     | 2   | 15-21 | 12+9        | 24+5       | 6+2             | 0+1         | 4+1         | 1+7             | 0+01          |               | 0+1        | 5+1        | 1 4+2      | .05+15  |
| B400489        | 04/28/89     | 2   | 21-27 | 5+8         | 27+6       | .4+2            | 0+1         | 6+2         | -1+7            | 0+01          |               | 0+1        | .7+1       | 1 2+2      | .17+15  |
| B400489        | 05/01/89     | 2   | 27-33 | 21+10       | 25+6       | .4+2            | 0+1         | 6+2         | -.2+9           | 0+01          |               | 0+1        | .6+1       | 1+1        | .14+14  |
| B400489        | 05/01/89     | 2   | 33-35 | 28+10       | 25+6       | 6+2             | 0+1         | 1+2         | -.2+5           | 0+01          |               | 0+1        | 6+1        | 1 3+2      | .18+14  |
| B400489        | 05/01/89     | 2   | 35-38 | 23+10       | 27+6       | 7+2             | 0+1         | 7+2         | -3+7            | 0+01          |               | 0+1        | 8+1        | 1 6+2      | -.06+14 |
| B400489        | 05/01/89     | 2   | 38-40 | 12+8        | 18+5       | 5+2             | 0+1         | 5+2         | -3+4            | 0+01          |               | 0+1        | .5+1       | 1 2+1      | .1+14   |
| B400489        | 05/01/89     | 2   | 40-46 | 18+9        | 15+5       | .4+2            | 0+1         | 2+1         | 0+7             | 0+01          |               | 0+1        | 6+1        | 5+2        | .05+14  |
| B400489        | 05/01/89     | 2   | 46-52 | 9+8         | 29+6       | 4+1             | 0+1         | .6+2        | -.3+7           | 0+01          |               | 0+1        | 5+1        | 1 2+1      | .13+14  |
| B400489        | 05/01/89     | 2   | 52-54 | 22+10       | 22+5       | 7+2             | 0+1         | 9+2         | -2+7            | 0+01          |               | 0+1        | 7+1        | 1+2        | .1+14   |
| B401989        | 04/05/89     | 2   | 00-03 | 40+16       | 24+6       | 9+3             | 0+1         | 1 1+3       | -2+5            | 0+02          |               | 1+1        | 1 3+1      | 2 1+2      | -1+15   |
| B401989        | 04/05/89     | 2   | 03-09 | 36+16       | 34+6       | 1 1+3           | 0+1         | 8+2         | -.1+5           | 0+02          |               | 0+1        | 1 2+1      | 2+2        | -1+15   |
| B401989        | 04/05/89     | 2   | 09-15 | 48+17       | 32+6       | 8+2             | 0+1         | .9+2        | -1+8            | 0+02          |               | 0+1        | 1 2+1      | 2 1+3      | .13+15  |
| B401989        | 04/05/89     | 2   | 15-19 | 32+15       | 33+6       | .9+3            | 0+1         | 9+3         | 2+6             | 01+02         |               | 0+1        | 7+1        | 1 6+2      | .02+15  |
| B401989        | 04/05/89     | 2   | 21-27 | 37+16       | 22+6       | 1+3             | 0+1         | 1 2+3       | -6+8            | 0+01          |               | 0+1        | 1 2+1      | 1 6+2      | -.02+15 |
| B401989        | 04/05/89     | 2   | 27-33 | 42+16       | 23+6       | 1 5+3           | 0+1         | 1 2+3       | -1+5            | 01+02         |               | 0+1        | 1 1+1      | 1 2+1      | .01+15  |
| B402189        | 03/29/89     | 1   | 00-03 | 28+14       | 24+6       | .5+2            | 1+1         | 7+2         | 0+5             | 02+02         |               | .2+1       |            |            | .04+15  |
| B402189        | 03/29/89     | 1   | 03-07 | 24+14       | 24+6       | .7+3            | .1+1        | 1 1+3       | -1+7            | 02+02         |               | 0+1        |            |            | .07+15  |
| B402189        | 03/29/89     | 1   | 07-13 | 43+17       | 32+6       | 1+3             | 0+1         | 1+2         | -1+6            | 0+02          |               | 0+1        |            |            | .05+15  |
| B402189        | 03/29/89     | 1   | 13-19 | 19+13       | 29+6       | 6+3             | 0+1         | 7+2         | -7+10           | 0+01          |               | 0+1        |            |            | .0+15   |

The table format is      concentration + counting error      Qtr=Quarter      =Missing data

**APPENDIX B**

**TOLERANCE INTERVAL  
CALCULATIONS**

Tolerance Interval Calculations for Total Metal Concentrations in  
Background Sediment Samples  
(Concentration units mg/kg)

| Analyte            | No of<br>Samples | No. of<br>Detects | Percent<br>Detects | Lower<br>Tolerance<br>Interval | Upper<br>Tolerance<br>Interval | Tolerance<br>Factor | Mean      | Standard<br>Deviation | Cohen<br>Revised<br>Mean | Cohen<br>Revised<br>Standard<br>Deviation | Cohen<br>Tau | Cohen<br>Lambda | Data<br>Distrib-<br>ution |
|--------------------|------------------|-------------------|--------------------|--------------------------------|--------------------------------|---------------------|-----------|-----------------------|--------------------------|---|--------------|-----------------|---------------------------|
| 1 Aluminum (Al)    | 18               | 18                | 100                | .                              | 8994.7474                      | 2.4529              | 5427.6204 | 1454.2208             | .                        | .   | .            | .               | LOG                       |
| 2 Antimony (Sb)    | 19               | 0                 | 0                  | .                              | .                              | 2.4230              | 9.7789    | 4.8942                | .                        | .   | .            | .               | NORMAL                    |
| 3 Arsenic (As)     | 19               | 4                 | 21                 | .                              | .                              | 2.4230              | 2.3763    | 2.9133                | .                        | .   | .            | .               | NORMAL                    |
| 4 Barium (Ba)      | 17               | 6                 | 35                 | .                              | .                              | 2.4863              | 62.3382   | 52.5242               | .                        | .   | .            | .               | NORMAL                    |
| 5 Beryllium (Be)   | 19               | 0                 | 0                  | .                              | .                              | 2.4230              | 0.8105    | 0.4054                | .                        | .   | .            | .               | NORMAL                    |
| 6 Cadmium (Cd)     | 15               | 0                 | 0                  | .                              | .                              | 2.5660              | 0.7200    | 0.2999                | .                        | .   | .            | .               | NORMAL                    |
| 7 Calcium (Ca)     | 19               | 9                 | 47                 | .                              | .                              | 2.4230              | 5953.4211 | 12226.3745            | .                        | .   | .            | .               | NORMAL                    |
| 8 Cesium (Cs)      | 19               | 0                 | 0                  | .                              | .                              | 2.4230              | 163.0263  | 81.6577               | .                        | .   | .            | .               | NORMAL                    |
| 9 Chromium (Cr)    | 19               | 15                | 79                 | .                              | 20.8456                        | 2.4230              | 10.7200   | 2.9063                | 11.6300                  | 3.8033                                    | 0.10         | 0.26            | LOG                       |
| 10 Cobalt (Co)     | 19               | 0                 | 0                  | .                              | .                              | 2.4230              | 8.1500    | 4.0843                | .                        | .   | .            | .               | NORMAL                    |
| 11 Copper (Cu)     | 19               | 6                 | 32                 | .                              | .                              | 2.4230              | 6.9395    | 6.1120                | .                        | .   | .            | .               | NORMAL                    |
| 12 Iron (Fe)       | 19               | 19                | 100                | .                              | 15664.9050                     | 2.4230              | 6215.2632 | 3899.9179             | .                        | .   | .            | .               | NORMAL                    |
| 13 Lead (Pb)       | 19               | 19                | 100                | .                              | 18.8158                        | 2.4230              | 11.9926   | 2.8160                | .                        | .   | .            | .               | LOG                       |
| 14 Lithium (Li)    | 19               | 0                 | 0                  | .                              | .                              | 2.4230              | 16.3026   | 8.1658                | .                        | .   | .            | .               | NORMAL                    |
| 15 Magnesium (Mg)  | 19               | 5                 | 26                 | .                              | .                              | 2.4230              | 1163.6842 | 938.9945              | .                        | .   | .            | .               | NORMAL                    |
| 16 Manganese (Mn)  | 19               | 19                | 100                | .                              | 357.6192                       | 2.4230              | 135.8947  | 91.5069               | .                        | .   | .            | .               | NORMAL                    |
| 17 Mercury (Hg)    | 19               | 0                 | 0                  | .                              | .                              | 2.4230              | 0.0824    | 0.0413                | .                        | .   | .            | .               | NORMAL                    |
| 18 Molybdenum (Mo) | 19               | 0                 | 0                  | .                              | .                              | 2.4230              | 16.3026   | 8.1658                | .                        | .   | .            | .               | NORMAL                    |
| 19 Nickel (Ni)     | 18               | 4                 | 22                 | .                              | .                              | 2.4529              | 8.6722    | 6.4137                | .                        | .   | .            | .               | NORMAL                    |
| 20 Potassium (K)   | 19               | 1                 | 5                  | .                              | .                              | 2.4230              | 851.3158  | 423.3459              | .                        | .   | .            | .               | NORMAL                    |
| 21 Selenium (Se)   | 19               | 0                 | 0                  | .                              | .                              | 2.4230              | 0.6671    | 0.2438                | .                        | .   | .            | .               | NORMAL                    |
| 22 Silver (Ag)     | 15               | 1                 | 7                  | .                              | .                              | 2.5660              | 1.7833    | 1.5111                | .                        | .   | .            | .               | NORMAL                    |
| 23 Sodium (Na)     | 19               | 0                 | 0                  | .                              | .                              | 2.4230              | 815.0000  | 408.4286              | .                        | .   | .            | .               | NORMAL                    |
| 24 Strontium (Sr)  | 19               | 3                 | 16                 | .                              | .                              | 2.4230              | 82.4500   | 62.3363               | .                        | .   | .            | .               | NORMAL                    |
| 25 Thallium (Tl)   | 13               | 0                 | 0                  | .                              | .                              | 2.6705              | 1.2538    | 0.3467                | .                        | .   | .            | .               | NORMAL                    |
| 26 Tin (Sn)        | 19               | 0                 | 0                  | .                              | .                              | 2.4230              | 16.3026   | 8.1658                | .                        | .   | .            | .               | NORMAL                    |
| 27 Vanadium (V)    | 17               | 9                 | 53                 | .                              | 24.1350                        | 2.4863              | 16.5968   | 2.7082                | 15.1788                  | 3.6023                                    | 0.21         | 0.77            | LOG                       |
| 28 Zinc (Zn)       | 19               | 19                | 100                | .                              | 91.7952                        | 2.4230              | 40.6211   | 21.1198               | .                        | .   | .            | .               | NORMAL                    |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values.

Tolerance Interval Calculations for Inorganic Concentrations in  
Background Sediment Samples  
(Concentration units mg/kg except pH)

| Analyte           | No of<br>Samples | No. of<br>Detects | Percent<br>Detects | Lower<br>Tolerance<br>Interval | Upper<br>Tolerance<br>Interval | Tolerance<br>Factor | Mean   | Standard<br>Deviation | Cohen<br>Revised<br>Mean | Cohen<br>Revised<br>Standard<br>Deviation | Cohen<br>Tau | Cohen<br>Lambda | Data<br>Distrib-<br>ution |
|-------------------|------------------|-------------------|--------------------|--------------------------------|--------------------------------|---------------------|--------|-----------------------|--------------------------|---|--------------|-----------------|---------------------------|
| 1 Lab pH          | 19               | 19                | 100                | 5 9878                         | 8 9280                         | 2.4230              | 7 4579 | 0.6067                |                          |   |              | .               | NORMAL                    |
| 2 Nitrate/Nitrite | 19               | 4                 | 21                 | .                              | .                              | 2.4230              | 2 3105 | 2.6826                |                          | .   |              | .               | NORMAL                    |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values.

Tolerance Interval Calculations for Total Radiochemical Concentrations in  
Background Sediment Samples  
(Concentration units pCi/g except Tritium units pCi/ml)

| Analyte             | No of<br>Samples | No of<br>Detects | Percent<br>Detects | Lower                 |                       | Upper                 |                       | Tolerance<br>Factor | Mean    | Standard<br>Deviation | Cohen<br>Revised |                      | Cohen<br>Tau | Cohen<br>Lambda | Data<br>Distrib-<br>ution |
|---------------------|------------------|------------------|--------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|---------|-----------------------|------------------|----------------------|--------------|-----------------|---------------------------|
|                     |                  |                  |                    | Tolerance<br>Interval | Tolerance<br>Interval | Tolerance<br>Interval | Tolerance<br>Interval |                     |         |                       | Mean             | Revised<br>Deviation |              |                 |                           |
| 1 Americium-241     | 10               | 10               | 100                | 0.0281                | 2.9110                | 0.0281                | 2.9110                | 2.9110              | -0.0020 | 0.0103                | .                | .                    | .            | .               | NORMAL                    |
| 2 Cesium-137        | 19               | 19               | 100                | 2.5959                | 2.4230                | 2.5959                | 2.4230                | 2.4230              | 0.5705  | 0.8359                | .                | .                    | .            | .               | NORMAL                    |
| 3 Gross Alpha       | 15               | 15               | 100                | 57.7542               | 2.5660                | 57.7542               | 2.5660                | 2.5660              | 21.8800 | 13.9806               | .                | .                    | .            | .               | NORMAL                    |
| 4 Gross Beta        | 15               | 15               | 100                | 51.7571               | 2.5660                | 51.7571               | 2.5660                | 2.5660              | 28.6800 | 8.9934                | .                | .                    | .            | .               | NORMAL                    |
| 5 Plutonium-239     | 19               | 19               | 100                | 0.0744                | 2.4230                | 0.0744                | 2.4230                | 2.4230              | 0.0174  | 0.0235                | .                | .                    | .            | .               | NORMAL                    |
| 6 Radium-226        | 19               | 19               | 100                | 1.1701                | 2.4230                | 1.1701                | 2.4230                | 2.4230              | 0.8000  | 0.1528                | .                | .                    | .            | .               | NORMAL                    |
| 7 Radium-228        | 19               | 19               | 100                | 1.5765                | 2.4230                | 1.5765                | 2.4230                | 2.4230              | 1.3875  | 0.0780                | .                | .                    | .            | .               | LOG                       |
| 8 Strontium-90      | 19               | 19               | 100                | 1.1015                | 2.4230                | 1.1015                | 2.4230                | 2.4230              | 0.1974  | 0.3731                | .                | .                    | .            | .               | NORMAL                    |
| 9 Tritium           | 19               | 19               | 100                | 1.1157                | 2.4230                | 1.1157                | 2.4230                | 2.4230              | 0.1726  | 0.3892                | .                | .                    | .            | .               | NORMAL                    |
| 10 Uranium-233,-234 | 19               | 19               | 100                | 1.6135                | 2.4230                | 1.6135                | 2.4230                | 2.4230              | 0.7842  | 0.3423                | .                | .                    | .            | .               | NORMAL                    |
| 11 Uranium-235      | 19               | 19               | 100                | 0.9710                | 2.4230                | 0.9710                | 2.4230                | 2.4230              | 0.1574  | 0.3358                | .                | .                    | .            | .               | NORMAL                    |
| 12 Uranium-238      | 19               | 19               | 100                | 0.8462                | 2.4230                | 0.8462                | 2.4230                | 2.4230              | 0.6769  | 0.0699                | .                | .                    | .            | .               | LOG                       |

NORMAL=Normal data distribution assumed    LOG=Log normal data distribution assumed    = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values.

Tolerance Interval Calculations for Total Metal Concentrations in  
Background Surface Water Samples  
(Concentration units mg/L)

| Analyte            | No. of<br>Samples | No. of<br>Detects | Percent<br>Detects | Lower    |          | Upper    |          | Tolerance<br>Factor | Mean    | Standard<br>Deviation | Cohen           |                                  | Cohen<br>Lambda | Data<br>Distrib-<br>ution |
|--------------------|-------------------|-------------------|--------------------|----------|----------|----------|----------|---------------------|---------|-----------------------|-----------------|----------------------------------|-----------------|---------------------------|
|                    |                   |                   |                    | Interval | Interval | Interval | Interval |                     |         |                       | Revised<br>Mean | Revised<br>Standard<br>Deviation |                 |                           |
| 1 Aluminum (Al)    | 52                | 34                | 65                 | .        | 60       | 4235     | 2.0553   | 8.2044              | 5.6795  | 0.618                 | 20.9352         | 19.2127                          | 0.43            | LOG                       |
| 2 Antimony (Sb)    | 49                | 1                 | 2                  | .        | .        | .        | 2.0701   | 0.0499              | 0.0618  | .                     | .               | .                                | .               | NORMAL                    |
| 3 Arsenic (As)     | 55                | 11                | 20                 | .        | .        | .        | 2.0419   | 0.0366              | 0.1535  | .                     | .               | .                                | .               | NORMAL                    |
| 4 Barium (Ba)      | 56                | 13                | 23                 | .        | .        | .        | 2.0377   | 0.3942              | 1.0031  | .                     | .               | .                                | .               | NORMAL                    |
| 5 Beryllium (Be)   | 52                | 3                 | 6                  | .        | .        | .        | 2.0553   | 0.0028              | 0.0018  | .                     | .               | .                                | .               | NORMAL                    |
| 6 Cadmium (Cd)     | 51                | 2                 | 4                  | .        | .        | .        | 2.0601   | 0.0039              | 0.0088  | .                     | .               | .                                | .               | NORMAL                    |
| 7 Cesium (Cs)      | 56                | 1                 | 2                  | .        | .        | .        | 2.0377   | 0.6541              | 0.4005  | .                     | .               | .                                | .               | NORMAL                    |
| 8 Chromium (Cr)    | 48                | 10                | 21                 | .        | .        | .        | 2.0754   | 0.0162              | 0.0407  | .                     | .               | .                                | .               | NORMAL                    |
| 9 Cobalt (Co)      | 51                | 3                 | 6                  | .        | .        | .        | 2.0601   | 0.0357              | 0.0658  | .                     | .               | .                                | .               | NORMAL                    |
| 10 Copper (Cu)     | 55                | 9                 | 16                 | .        | .        | .        | 2.0419   | 0.0328              | 0.0854  | .                     | .               | .                                | .               | NORMAL                    |
| 11 Iron (Fe)       | 56                | 53                | 95                 | .        | 87       | 1476     | 2.0377   | 33.0397             | 26.5529 | .                     | .               | .                                | .               | LOG                       |
| 12 Lead (Pb)       | 54                | 17                | 31                 | .        | .        | .        | 2.0463   | 0.0370              | 0.1013  | .                     | .               | .                                | .               | NORMAL                    |
| 13 Magnesium (Mg)  | 56                | 40                | 71                 | .        | 8        | 9377     | 2.0377   | 6.9424              | 0.6718  | 6.9461                | 0.9774          | 0.19                             | 0.44            | LOG                       |
| 14 Manganese (Mn)  | 56                | 43                | 77                 | .        | 1        | 9654     | 2.0377   | 0.4513              | 0.2565  | 0.7601                | 0.5915          | 0.35                             | 0.37            | LOG                       |
| 15 Mercury (Hg)    | 48                | 11                | 23                 | .        | .        | .        | 2.0754   | 0.0002              | 0.0003  | .                     | .               | .                                | .               | NORMAL                    |
| 16 Molybdenum (Mo) | 56                | 8                 | 14                 | .        | .        | .        | 2.0377   | 0.0625              | 0.0575  | .                     | .               | .                                | .               | NORMAL                    |
| 17 Nickel (Ni)     | 46                | 3                 | 7                  | .        | .        | .        | 2.0865   | 0.0394              | 0.0982  | .                     | .               | .                                | .               | NORMAL                    |
| 18 Potassium (K)   | 53                | 9                 | 17                 | .        | .        | .        | 2.0507   | 2.9749              | 1.7053  | .                     | .               | .                                | .               | NORMAL                    |
| 19 Selenium (Se)   | 53                | 2                 | 4                  | .        | .        | .        | 2.0507   | 0.0029              | 0.0022  | .                     | .               | .                                | .               | NORMAL                    |
| 20 Silver (Ag)     | 54                | 4                 | 7                  | .        | .        | .        | 2.0463   | 0.0093              | 0.0199  | .                     | .               | .                                | .               | NORMAL                    |
| 21 Strontium (Sr)  | 56                | 24                | 43                 | .        | .        | .        | 2.0377   | 0.3952              | 0.2692  | .                     | .               | .                                | .               | NORMAL                    |
| 22 Thallium (Tl)   | 54                | 0                 | 0                  | .        | .        | .        | 2.0463   | 0.0063              | 0.0052  | .                     | .               | .                                | .               | NORMAL                    |
| 23 Tin (Sn)        | 56                | 3                 | 5                  | .        | .        | .        | 2.0377   | 0.1100              | 0.1808  | .                     | .               | .                                | .               | NORMAL                    |
| 24 Vanadium (V)    | 55                | 8                 | 15                 | .        | .        | .        | 2.0419   | 0.0761              | 0.2307  | .                     | .               | .                                | .               | NORMAL                    |
| 25 Zinc (Zn)       | 54                | 41                | 76                 | .        | 0        | 3765     | 2.0463   | 0.1441              | 0.0438  | 0.1903                | 0.0910          | 0.29                             | 0.37            | LOG                       |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values.

Tolerance Interval Calculations for Total Metal Concentrations in  
Background North Rocky Flats Surface Water Samples  
(Concentration units mg/l)

| Analyte        | No. of<br>Samples | No. of<br>Detects | Percent<br>Detects | Lower                 |          | Upper                 |          | Tolerance<br>Factor | Mean    | Standard<br>Deviation | Cohen<br>Revised |           | Cohen<br>Tau | Cohen<br>Lambda | Data<br>Distribution |
|----------------|-------------------|-------------------|--------------------|-----------------------|----------|-----------------------|----------|---------------------|---------|-----------------------|------------------|-----------|--------------|-----------------|----------------------|
|                |                   |                   |                    | Tolerance<br>Interval | Interval | Tolerance<br>Interval | Interval |                     |         |                       | Mean             | Deviation |              |                 |                      |
| 1 Calcium (Ca) | 30                | 30                | 100                | .                     | .        | 43.3634               | 2.2198   | 2.2198              | 33.3266 | 4.5214                | .                | .         | .            | .               | LOG                  |
| 2 Lithium (Li) | 30                | 6                 | 20                 | .                     | .        | .                     | 2.2198   | 2.2198              | 0.0391  | 0.0187                | .                | .         | .            | .               | NORMAL               |
| 3 Sodium (Na)  | 30                | 30                | 100                | .                     | .        | 23.0992               | 2.2198   | 2.2198              | 20.3840 | 1.2232                | .                | .         | .            | .               | LOG                  |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values.

Tolerance Interval Calculations for Total Metal Concentrations in  
Background South Rocky Flats Surface Water Samples  
(Concentration units mg/l)

| Analyte        | No of<br>Samples | No. of<br>Detects | Percent<br>Detects | Lower                 |          | Upper                 |          | Tolerance<br>Factor | Mean    | Standard<br>Deviation | Cohen<br>Revised |           | Cohen<br>Tau | Cohen<br>Lambda | Data<br>Distrib-<br>ution |
|----------------|------------------|-------------------|--------------------|-----------------------|----------|-----------------------|----------|---------------------|---------|-----------------------|------------------|-----------|--------------|-----------------|---------------------------|
|                |                  |                   |                    | Tolerance<br>Interval | Interval | Tolerance<br>Interval | Interval |                     |         |                       | Mean             | Deviation |              |                 |                           |
| 1 Calcium (Ca) | 26               | 26                | 100                | .                     | .        | 106.9661              | .        | 2.2753              | 71.9915 | 15.3714               | .                | .         | .            | .               | LOG                       |
| 2 Lithium (Li) | 26               | 0                 | 0                  | .                     | .        | .                     | .        | 2.2753              | 0.0448  | 0.0147                | .                | .         | .            | .               | NORMAL                    |
| 3 Sodium (Na)  | 26               | 25                | 96                 | .                     | .        | 17.7691               | .        | 2.2753              | 13.9782 | 1.6661                | .                | .         | .            | .               | LOG                       |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values.

Tolerance Interval Calculations for Dissolved Metal Concentrations in  
Background Surface Water Samples  
(Concentration units mg/l)

| Analyte            | No. of<br>Samples | No. of<br>Detects | Percent<br>Detects | Lower                 |          | Upper                 |          | Tolerance<br>Factor | Mean   | Standard<br>Deviation | Cohen           |                                  | Cohen<br>Lambda | Data<br>Distrib-<br>ution |
|--------------------|-------------------|-------------------|--------------------|-----------------------|----------|-----------------------|----------|---------------------|--------|-----------------------|-----------------|----------------------------------|-----------------|---------------------------|
|                    |                   |                   |                    | Tolerance<br>Interval | Interval | Tolerance<br>Interval | Interval |                     |        |                       | Revised<br>Mean | Revised<br>Standard<br>Deviation |                 |                           |
| 1 Aluminum (Al)    | 48                | 7                 | 15                 | .                     | .        | .                     | .        | 2.0754              | 0.1166 | 0.0827                | .               | .                                | .               | NORMAL                    |
| 2 Antimony (Sb)    | 51                | 0                 | 0                  | .                     | .        | .                     | .        | 2.0601              | 0.0473 | 0.0597                | .               | .                                | .               | NORMAL                    |
| 3 Arsenic (As)     | 54                | 1                 | 2                  | .                     | .        | .                     | .        | 2.0463              | 0.0049 | 0.0021                | .               | .                                | .               | NORMAL                    |
| 4 Barium (Ba)      | 57                | 1                 | 2                  | .                     | .        | .                     | .        | 2.0337              | 0.0967 | 0.0247                | .               | .                                | .               | NORMAL                    |
| 5 Beryllium (Be)   | 50                | 0                 | 0                  | .                     | .        | .                     | .        | 2.0650              | 0.0024 | 0.0004                | .               | .                                | .               | NORMAL                    |
| 6 Cadmium (Cd)     | 53                | 0                 | 0                  | .                     | .        | .                     | .        | 2.0507              | 0.0025 | 0.0001                | .               | .                                | .               | NORMAL                    |
| 7 Cesium (Cs)      | 57                | 0                 | 0                  | .                     | .        | .                     | .        | 2.0337              | 0.6421 | 0.3274                | .               | .                                | .               | NORMAL                    |
| 8 Chromium (Cr)    | 46                | 0                 | 0                  | .                     | .        | .                     | .        | 2.0865              | 0.0054 | 0.0014                | .               | .                                | .               | NORMAL                    |
| 9 Cobalt (Co)      | 52                | 0                 | 0                  | .                     | .        | .                     | .        | 2.0553              | 0.0244 | 0.0029                | .               | .                                | .               | NORMAL                    |
| 10 Copper (Cu)     | 56                | 2                 | 4                  | .                     | .        | .                     | .        | 2.0377              | 0.0128 | 0.0028                | .               | .                                | .               | NORMAL                    |
| 11 Iron (Fe)       | 57                | 27                | 47                 | .                     | .        | .                     | .        | 2.0337              | 0.6777 | 2.2671                | .               | .                                | .               | NORMAL                    |
| 12 Lead (Pb)       | 54                | 6                 | 11                 | .                     | .        | .                     | .        | 2.0463              | 0.0027 | 0.0017                | .               | .                                | .               | NORMAL                    |
| 13 Magnesium (Mg)  | 58                | 30                | 52                 | .                     | .        | 6.4118                | .        | 2.0297              | 5.0245 | 0.4186                | 4.7569          | 0.8153                           | 0.16            | LOG                       |
| 14 Manganese (Mn)  | 56                | 31                | 55                 | .                     | .        | 0.5096                | .        | 2.0377              | 0.0888 | 0.0311                | 0.1979          | 0.1530                           | 0.24            | LOG                       |
| 15 Mercury (Hg)    | 49                | 7                 | 14                 | .                     | .        | .                     | .        | 2.0701              | 0.0002 | 0.0002                | .               | .                                | .               | NORMAL                    |
| 16 Molybdenum (Mo) | 56                | 5                 | 9                  | .                     | .        | .                     | .        | 2.0377              | 0.0611 | 0.0538                | .               | .                                | .               | NORMAL                    |
| 17 Nickel (Ni)     | 46                | 0                 | 0                  | .                     | .        | .                     | .        | 2.0865              | 0.0191 | 0.0028                | .               | .                                | .               | NORMAL                    |
| 18 Potassium (K)   | 51                | 4                 | 8                  | .                     | .        | .                     | .        | 2.0601              | 2.4649 | 0.1986                | .               | .                                | .               | NORMAL                    |
| 19 Selenium (Se)   | 49                | 2                 | 4                  | .                     | .        | .                     | .        | 2.0701              | 0.0027 | 0.0017                | .               | .                                | .               | NORMAL                    |
| 20 Silver (Ag)     | 58                | 1                 | 2                  | .                     | .        | .                     | .        | 2.0297              | 0.0058 | 0.0027                | .               | .                                | .               | NORMAL                    |
| 21 Strontium (Sr)  | 58                | 25                | 43                 | .                     | .        | .                     | .        | 2.0297              | 0.3410 | 0.2010                | .               | .                                | .               | NORMAL                    |
| 22 Thallium (Tl)   | 57                | 0                 | 0                  | .                     | .        | .                     | .        | 2.0337              | 0.0097 | 0.0082                | .               | .                                | .               | NORMAL                    |
| 23 Tin (Sn)        | 58                | 0                 | 0                  | .                     | .        | .                     | .        | 2.0297              | 0.0810 | 0.1150                | .               | .                                | .               | NORMAL                    |
| 24 Vanadium (V)    | 57                | 0                 | 0                  | .                     | .        | .                     | .        | 2.0337              | 0.0236 | 0.0052                | .               | .                                | .               | NORMAL                    |
| 25 Zinc (Zn)       | 53                | 15                | 28                 | .                     | .        | .                     | .        | 2.0507              | 0.0180 | 0.0185                | .               | .                                | .               | NORMAL                    |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values.

Tolerance Interval Calculations for Dissolved Metal Concentrations in  
Background North Rocky Flats Surface Water Samples  
(Concentration units mg/l)

| Analyte        | No. of<br>Samples | No. of<br>Detects | Percent<br>Detects | Lower                 |          | Upper                 |          | Tolerance<br>Factor | Mean    | Standard<br>Deviation | Cohen<br>Revised |           | Cohen<br>Tau | Cohen<br>Lambda | Data<br>Distrib-<br>ution |
|----------------|-------------------|-------------------|--------------------|-----------------------|----------|-----------------------|----------|---------------------|---------|-----------------------|------------------|-----------|--------------|-----------------|---------------------------|
|                |                   |                   |                    | Tolerance<br>Interval | Interval | Tolerance<br>Interval | Interval |                     |         |                       | Mean             | Deviation |              |                 |                           |
| 1 Calcium (Ca) | 31                | 31                | 100                |                       |          | 37.8275               |          | 2.2080              | 29 7823 | 3.6437                |                  |           |              |                 | LOG                       |
| 2 Lithium (Li) | 31                | 7                 | 23                 | .                     | .        | .                     | .        | 2 2080              | 0 0408  | 0.0220                |                  |           |              |                 | NORMAL                    |
| 3 Sodium (Na)  | 31                | 31                | 100                |                       |          | 22 4768               |          | 2.2080              | 19 9159 | 1.1598                |                  |           | .            | .               | LOG                       |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values.

Tolerance Interval Calculations for Dissolved Metal Concentrations in  
Background South Rocky Flats Surface Water Samples  
(Concentration units mg/l)

| Analyte        | No. of<br>Samples | No. of<br>Detects | Percent<br>Detects | Lower    |          | Upper    |          | Tolerance<br>Factor | Tolerance<br>Interval | Mean   | Standard<br>Deviation | Cohen           |                                  | Cohen<br>Tau | Cohen<br>Lambda | Data<br>Distrib-<br>ution |
|----------------|-------------------|-------------------|--------------------|----------|----------|----------|----------|---------------------|-----------------------|--------|-----------------------|-----------------|----------------------------------|--------------|-----------------|---------------------------|
|                |                   |                   |                    | Interval | Interval | Interval | Interval |                     |                       |        |                       | Revised<br>Mean | Revised<br>Standard<br>Deviation |              |                 |                           |
| 1 Calcium (Ca) | 27                | 27                | 100                | .        | .        | 39 8803  | 2.2600   | 2.2600              | 33 7082               | 2 7310 | 2 7310                | .               | .                                | .            | .               | LOG                       |
| 2 Lithium (Li) | 27                | 0                 | 0                  | .        | .        | .        | 2.2600   | 2.2600              | 0 0450                | 0 0144 | 0 0144                | .               | .                                | .            | .               | NORMAL                    |
| 3 Sodium (Na)  | 27                | 27                | 100                | .        | .        | 16 3758  | 2.2600   | 2.2600              | 13.3162               | 1 3538 | 1 3538                | .               | .                                | .            | .               | LOG                       |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values.

Tolerance Interval Calculations for Inorganic Concentrations in  
Background Surface Water Samples  
(Concentration units mg/l except pH)

| Analyte            | No of<br>Samples | No. of<br>Detects | Percent<br>Detects | Lower                 |                       | Upper                 |          | Tolerance<br>Factor | Standard<br>Deviation | Cohen           |                                  | Cohen<br>Lambda | Data<br>Distrib-<br>ution |
|--------------------|------------------|-------------------|--------------------|-----------------------|-----------------------|-----------------------|----------|---------------------|-----------------------|-----------------|----------------------------------|-----------------|---------------------------|
|                    |                  |                   |                    | Tolerance<br>Interval | Tolerance<br>Interval | Tolerance<br>Interval | Mean     |                     |                       | Revised<br>Mean | Revised<br>Standard<br>Deviation |                 |                           |
| 1 Bicarbonate      | 59               | 59                | 100                |                       | 202.1725              | 2.0259                | 166 1012 | 2.0259              | 17 8052               |                 |                                  |                 | LOG                       |
| 2 Carbonate        | 59               | 0                 | 0                  |                       | .                     | 2.0259                | 2 5000   | 2.0259              | 0 0000                |                 |                                  |                 | NORMAL                    |
| 3 Chloride         | 59               | 56                | 95                 | .                     | 15 7253               | 2.0259                | 12 6992  | 2.0259              | 1 4937                |                 |                                  |                 | LOG                       |
| 4 Cyanide          | 56               | 4                 | 7                  | .                     | .                     | 2.0377                | 0 0046   | 2.0377              | 0.0077                |                 |                                  |                 | NORMAL                    |
| 5 Dissolved Solids | 59               | 58                | 98                 | .                     | 221 3628              | 2.0259                | 192 5504 | 2.0259              | 14.2221               |                 |                                  |                 | LOG                       |
| 6 Field pH         | 65               | 65                | 100                | 5.5825                | 9 0230                | 2.0050                | 7.3028   | 2.0050              | 0.8580                |                 |                                  |                 | NORMAL                    |
| 7 Nitrate/Nitrite  | 59               | 34                | 58                 | .                     | 3 9883                | 2.0259                | 0 8233   | 2.0259              | 0 4043                | 1.5412          | 1 2079                           | 0 22            | LOG                       |
| 8 Sulfate          | 59               | 54                | 92                 | .                     | 36 9676               | 2.0259                | 29 4620  | 2.0259              | 3 7048                |                 |                                  | 0 65            | LOG                       |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values

Tolerance Interval Calculations for Total Radiochemical Concentrations in  
Background Surface Water Samples  
(Concentration units pCi/l)

| Analyte              | No. of<br>Samples | No. of<br>Detects | Percent<br>Detects | Lower    |                       | Upper     |                       | Tolerance<br>Factor | Mean      | Standard<br>Deviation | Cohen<br>Revised |                       | Cohen<br>Tau | Cohen<br>Lambda | Data<br>Distrib-<br>ution |
|----------------------|-------------------|-------------------|--------------------|----------|-----------------------|-----------|-----------------------|---------------------|-----------|-----------------------|------------------|-----------------------|--------------|-----------------|---------------------------|
|                      |                   |                   |                    | Interval | Tolerance<br>Interval | Interval  | Tolerance<br>Interval |                     |           |                       | Mean             | Standard<br>Deviation |              |                 |                           |
| 1 Americium-241      | 44                | 44                | 100                | .        | .                     | 0.1769    | 2 0985                | 0.0265              | 0 0717    | .                     | .                | .                     | .            | .               | NORMAL                    |
| 2 Cesium-137         | 50                | 50                | 100                | .        | .                     | 3.9312    | 2 0650                | 0.3843              | 1 7176    | .                     | .                | .                     | .            | .               | NORMAL                    |
| 3 Gross Alpha        | 49                | 49                | 100                | .        | .                     | 177.4289  | 2 0701                | 25 5367             | 73 3749   | .                     | .                | .                     | .            | .               | NORMAL                    |
| 4 Gross Beta         | 49                | 49                | 100                | .        | .                     | 163 2045  | 2 0701                | 24 2510             | 67.1246   | .                     | .                | .                     | .            | .               | NORMAL                    |
| 5 Plutonium-239      | 50                | 50                | 100                | .        | .                     | 1.4577    | 2 0650                | 0.1371              | 0.6395    | .                     | .                | .                     | .            | .               | NORMAL                    |
| 6 Radium-226         | 13                | 13                | 100                | .        | .                     | 29 2468   | 2 6705                | 5.4308              | 8.9182    | .                     | .                | .                     | .            | .               | NORMAL                    |
| 7 Radium-228         | 4                 | 4                 | 100                | .        | .                     | 64.2265   | 5 1439                | 11.4750             | 10 2552   | .                     | .                | .                     | .            | .               | NORMAL                    |
| 8 Strontium-90       | 50                | 50                | 100                | .        | .                     | 1.6121    | 2 0650                | 0.4819              | 0 5475    | .                     | .                | .                     | .            | .               | NORMAL                    |
| 9 Tritium            | 50                | 50                | 100                | .        | .                     | 2022.4548 | 2 0650                | -96.0000            | 1025.8894 | .                     | .                | .                     | .            | .               | NORMAL                    |
| 10 Uranium-233, -234 | 50                | 50                | 100                | .        | .                     | 1.1054    | 2 0650                | 0.3898              | 0 3466    | .                     | .                | .                     | .            | .               | NORMAL                    |
| 11 Uranium-235       | 50                | 50                | 100                | .        | .                     | 0.1863    | 2 0650                | 0 0206              | 0 0802    | .                     | .                | .                     | .            | .               | NORMAL                    |
| 12 Uranium-238       | 50                | 50                | 100                | .        | .                     | 0.9186    | 2 0650                | 0.3128              | 0 2934    | .                     | .                | .                     | .            | .               | NORMAL                    |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values.

Tolerance Interval Calculations for Dissolved Metal Concentrations in  
Background Rocky Flats Alluvial Ground Water Samples  
(Concentration units mg/l)

| Analyte           | No of<br>Samples | No. of<br>Detects | Percent<br>Detects | Lower<br>Tolerance<br>Interval | Upper<br>Tolerance<br>Interval | Tolerance<br>Factor | Mean    | Standard<br>Deviation | Cohen<br>Revised<br>Mean | Cohen<br>Revised<br>Standard<br>Deviation | Cohen<br>Tau | Cohen<br>Lambda | Data<br>Distrib-<br>ution |
|-------------------|------------------|-------------------|--------------------|--------------------------------|--------------------------------|---------------------|---------|-----------------------|--------------------------|---|--------------|-----------------|---------------------------|
| 1 Aluminum (Al)   | 23               | 4                 | 17                 | .                              | .                              | 2.3283              | 0.0835  | 0.0311                |                          |   |              |                 | NORMAL                    |
| 2 Antimony (Sb)   | 29               | 0                 | 0                  | .                              | .                              | 2.2324              | 0.0670  | 0.0851                |                          |   |              | .               | NORMAL                    |
| 3 Arsenic (As)    | 21               | 0                 | 0                  | .                              | .                              | 2.3714              | 0.0038  | 0.0019                |                          |   |              |                 | NORMAL                    |
| 4 Barium (Ba)     | 30               | 8                 | 27                 | .                              | .                              | 2.2198              | 0.0951  | 0.0119                |                          |   |              |                 | NORMAL                    |
| 5 Beryllium (Be)  | 22               | 0                 | 0                  | .                              | .                              | 2.3490              | 0.0020  | 0.0007                |                          | .   |              |                 | NORMAL                    |
| 6 Cadmium (Cd)    | 30               | 2                 | 7                  | .                              | .                              | 2.2198              | 0.0028  | 0.0017                |                          | .   |              |                 | NORMAL                    |
| 7 Calcium (Ca)    | 30               | 30                | 100                |                                | 43.5726                        | 2.2198              | 36.6861 | 3.1023                |                          | .   |              |                 | LOG                       |
| 8 Cesium (Cs)     | 29               | 0                 | 0                  | .                              | .                              | 2.2324              | 0.4466  | 0.2343                |                          |   |              |                 | NORMAL                    |
| 9 Chromium (Cr)   | 25               | 1                 | 4                  | .                              | .                              | 2.2917              | 0.0061  | 0.0021                |                          |   |              |                 | NORMAL                    |
| 10 Cobalt (Co)    | 30               | 0                 | 0                  | .                              | .                              | 2.2198              | 0.0218  | 0.0060                |                          |   |              |                 | NORMAL                    |
| 11 Copper (Cu)    | 27               | 1                 | 4                  | .                              | .                              | 2.2600              | 0.0116  | 0.0033                |                          | .   |              | .               | NORMAL                    |
| 12 Iron (Fe)      | 27               | 7                 | 26                 | .                              | .                              | 2.2600              | 0.0706  | 0.0576                |                          | .   |              | .               | NORMAL                    |
| 13 Lead (Pb)      | 29               | 2                 | 7                  | .                              | .                              | 2.2324              | 0.0022  | 0.0008                |                          | .   |              |                 | NORMAL                    |
| 14 Lithium (Li)   | 26               | 5                 | 19                 | .                              | .                              | 2.2753              | 0.0402  | 0.0184                |                          |   |              |                 | NORMAL                    |
| 15 Magnesium (Mg) | 30               | 13                | 43                 | .                              | .                              | 2.2198              | 3.5688  | 0.2361                |                          |   |              |                 | LOG                       |
| 16 Manganese (Mn) | 29               | 21                | 72                 | .                              | 0.1356                         | 2.2324              | 0.0560  | 0.0164                | 0.0706                   | 0.0291                                    | 0.32         | 0.37            | LOG                       |
| 17 Mercury (Hg)   | 24               | 0                 | 0                  | .                              | .                              | 2.3093              | 0.0001  | 0.0000                |                          | .   |              | .               | NORMAL                    |
| 18 Molybdenum(Mo) | 30               | 1                 | 3                  | .                              | .                              | 2.2198              | 0.0797  | 0.0782                |                          | .   |              | .               | NORMAL                    |
| 19 Nickel (Ni)    | 27               | 2                 | 7                  | .                              | .                              | 2.2600              | 0.0188  | 0.0065                |                          | .   |              |                 | NORMAL                    |
| 20 Potassium (K)  | 25               | 7                 | 28                 | .                              | .                              | 2.2917              | 2.2882  | 1.3731                |                          | .   |              |                 | NORMAL                    |
| 21 Selenium (Se)  | 27               | 1                 | 4                  | .                              | .                              | 2.2600              | 0.0033  | 0.0047                |                          | .   |              | .               | NORMAL                    |
| 22 Silver (Ag)    | 29               | 0                 | 0                  | .                              | .                              | 2.2324              | 0.0065  | 0.0040                |                          | .   |              | .               | NORMAL                    |
| 23 Sodium (Na)    | 30               | 28                | 93                 |                                | 8.8696                         | 2.2198              | 7.7573  | 0.5011                |                          | .   |              |                 | LOG                       |
| 24 Strontium (Sr) | 30               | 10                | 33                 | .                              | .                              | 2.2198              | 0.3513  | 0.1872                |                          | .   |              |                 | NORMAL                    |
| 25 Thallium (Tl)  | 28               | 0                 | 0                  | .                              | .                              | 2.2458              | 0.0058  | 0.0052                |                          | .   |              |                 | NORMAL                    |
| 26 Tin (Sn)       | 28               | 0                 | 0                  | .                              | .                              | 2.2458              | 0.1375  | 0.1762                |                          | .   |              |                 | NORMAL                    |
| 27 Vanadium (V)   | 29               | 0                 | 0                  | .                              | .                              | 2.2324              | 0.0210  | 0.0077                |                          | .   |              | .               | NORMAL                    |
| 28 Zinc (Zn)      | 23               | 11                | 48                 | .                              | .                              | 2.3283              | 0.0258  | 0.0290                |                          | .   |              | .               | NORMAL                    |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values.

Tolerance Interval Calculations for Inorganic Concentrations in  
Background Rocky Flats Alluvial Ground Water Samples  
(Concentration units mg/l except pH)

| Analyte            | No of<br>Samples | No. of<br>Detects | Percent<br>Detects | Lower                 |          | Upper                 |          | Tolerance<br>Factor | Mean     | Standard<br>Deviation | Cohen<br>Revised |                       | Cohen<br>Tau | Cohen<br>Lambda | Data<br>Distrib-<br>ution |
|--------------------|------------------|-------------------|--------------------|-----------------------|----------|-----------------------|----------|---------------------|----------|-----------------------|------------------|-----------------------|--------------|-----------------|---------------------------|
|                    |                  |                   |                    | Tolerance<br>Interval | Interval | Tolerance<br>Interval | Interval |                     |          |                       | Mean             | Standard<br>Deviation |              |                 |                           |
| 1 Bicarbonate      | 36               | 36                | 100                | .                     | .        | 146.7346              | 2 1577   | 2 1577              | 125 6275 | 9 7824                |                  |                       |              |                 | LOG                       |
| 2 Carbonate        | 35               | 0                 | 0                  | .                     | .        | .                     | 2 1667   | 2 1667              | 2 5000   | 0 0000                |                  | .                     |              |                 | NORMAL                    |
| 3 Cyanide          | 26               | 2                 | 8                  | .                     | .        | .                     | 2 2753   | 2 2753              | 0.0032   | 0 0018                |                  |                       |              |                 | NORMAL                    |
| 4 Dissolved Solids | 36               | 36                | 100                | .                     | .        | 235 7493              | 2 1577   | 2 1577              | 209 3996 | 12 2121               |                  | .                     |              |                 | LOG                       |
| 5 Field pH         | 38               | 38                | 100                | 6 0781                | 8.3193   | 2 1408                | 2 1408   | 2 1408              | 7.1987   | 0.5234                |                  |                       |              |                 | NORMAL                    |
| 6 Nitrate/Nitrite  | 36               | 36                | 100                | .                     | .        | 2 1734                | 2 1577   | 2 1577              | 1 6568   | 0 2394                |                  | .                     |              |                 | LOG                       |
| 7 Sulfate          | 36               | 36                | 100                | .                     | .        | 25.2270               | 2 1577   | 2 1577              | 22.6385  | 1.1997                |                  |                       | .            |                 | LOG                       |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values.

Tolerance Interval Calculations for Inorganic Concentrations in  
Background North Rocky Flats Rocky Flats Alluvial Ground Water Samples  
(Concentration units mg/l except pH)

| <u>Analyte</u> | <u>No. of<br/>Samples</u> | <u>No of<br/>Detects</u> | <u>Percent<br/>Detects</u> | <u>Lower</u>    |                 | <u>Upper</u>    |                 | <u>Tolerance<br/>Factor</u> | <u>Tolerance<br/>Interval</u> | <u>Mean</u> | <u>Standard<br/>Deviation</u> | <u>Cohen<br/>Revised</u> |                  | <u>Cohen<br/>Tau</u> | <u>Cohen<br/>Lambda</u> | <u>Data<br/>Distrib-<br/>ution</u> |
|----------------|---------------------------|--------------------------|----------------------------|-----------------|-----------------|-----------------|-----------------|-----------------------------|-------------------------------|-------------|-------------------------------|--------------------------|------------------|----------------------|-------------------------|------------------------------------|
|                |                           |                          |                            | <u>Interval</u> | <u>Interval</u> | <u>Interval</u> | <u>Interval</u> |                             |                               |             |                               | <u>Mean</u>              | <u>Deviation</u> |                      |                         |                                    |
| 1 Chloride     | 15                        | 15                       | 100                        |                 |                 | 7.5743          | 2 5660          | 5 7419                      | 0 7141                        |             |                               |                          |                  |                      |                         | LOG                                |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values.

Tolerance Interval Calculations for Inorganic Concentrations in  
Background South Rocky Flats Rocky Flats Alluvial Ground Water Samples  
(Concentration units mg/l except pH)

| Analyte    | No. of<br>Samples | No. of<br>Detects | Percent<br>Detects | Lower                 |          | Upper                 |          | Tolerance<br>Factor | Mean   | Standard<br>Deviation | Cohen<br>Revised |           | Cohen<br>Tau | Cohen<br>Lambda | Data<br>Distrib-<br>ution |
|------------|-------------------|-------------------|--------------------|-----------------------|----------|-----------------------|----------|---------------------|--------|-----------------------|------------------|-----------|--------------|-----------------|---------------------------|
|            |                   |                   |                    | Tolerance<br>Interval | Interval | Tolerance<br>Interval | Interval |                     |        |                       | Mean             | Deviation |              |                 |                           |
| 1 Chloride | 21                | 17                | 81                 | .                     | 11 0388  | 2.3714                | 6 9998   | 1 2660              | 7.1788 | 1 6277                | 0 10             | 0 26      | LOG          |                 |                           |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed = result is not applicable  
Statistics for log normal distributions are presented as untransformed (anti-log) values.

Tolerance Interval Calculations for Dissolved Radiochemical Concentrations in  
Background Rocky Flats Alluvial Ground Water Samples  
(Concentration units pCi/l)

| Analyte         | No. of<br>Samples | No of<br>Detects | Percent<br>Detects | Lower                 |                       | Upper                 |                     | Mean     | Standard<br>Deviation | Cohen<br>Revised |                       | Cohen<br>Tau | Cohen<br>Lambda | Data<br>Distrib-<br>ution |
|-----------------|-------------------|------------------|--------------------|-----------------------|-----------------------|-----------------------|---------------------|----------|-----------------------|------------------|-----------------------|--------------|-----------------|---------------------------|
|                 |                   |                  |                    | Tolerance<br>Interval | Tolerance<br>Interval | Tolerance<br>Interval | Tolerance<br>Factor |          |                       | Mean             | Standard<br>Deviation |              |                 |                           |
| 1 Americium-241 | 24                | 24               | 100                | .                     | 0.0197                | 2.3093                | 0.0025              | 0.0074   | 0.0025                | 0.0074           | 0.0074                | .            | .               | NORMAL                    |
| 2 Cesium-137    | 28                | 28               | 100                | .                     | 0.6237                | 2.2458                | 0.0936              | 0.2361   | 0.0936                | 0.2361           | 0.2361                | .            | .               | NORMAL                    |
| 3 Gross Alpha   | 28                | 28               | 100                | .                     | 7.7990                | 2.2458                | 2.0179              | 2.5742   | 2.0179                | 2.5742           | 2.5742                | .            | .               | NORMAL                    |
| 4 Gross Beta    | 28                | 28               | 100                | .                     | 8.7694                | 2.2458                | 2.4857              | 2.7980   | 2.4857                | 2.7980           | 2.7980                | .            | .               | NORMAL                    |
| 5 Plutonium-239 | 27                | 27               | 100                | .                     | 0.0118                | 2.2600                | 0.0019              | 0.0044   | 0.0019                | 0.0044           | 0.0044                | .            | .               | NORMAL                    |
| 6 Radium-226    | 6                 | 6                | 100                | .                     | .                     | 3.7077                | 28.5708             | 69.2861  | 28.5708               | 69.2861          | 69.2861               | .            | .               | NORMAL                    |
| 7 Strontium-90  | 28                | 28               | 100                | .                     | 1.2300                | 2.2458                | 0.1286              | 0.4904   | 0.1286                | 0.4904           | 0.4904                | .            | .               | NORMAL                    |
| 8 Tritium       | 27                | 27               | 100                | .                     | 454.2380              | 2.2600                | 110.3704            | 152.1508 | 110.3704              | 152.1508         | 152.1508              | .            | .               | NORMAL                    |
| 9 Uranium-235   | 28                | 28               | 100                | .                     | 0.1601                | 2.2458                | 0.0221              | 0.0614   | 0.0221                | 0.0614           | 0.0614                | .            | .               | NORMAL                    |
| 10 Uranium-238  | 28                | 28               | 100                | .                     | 0.9806                | 2.2458                | 0.2654              | 0.3185   | 0.2654                | 0.3185           | 0.3185                | .            | .               | NORMAL                    |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values.

Tolerance Interval Calculations for Dissolved Metal Concentrations in  
Background Colluvial Ground Water Samples  
(Concentration units mg/L)

| Analyte            | No. of<br>Samples | No. of<br>Detects | Percent<br>Detects | Lower    |           | Upper    |           | Tolerance<br>Factor | Mean    | Standard<br>Deviation | Cohen           |                                  | Cohen<br>Tau | Cohen<br>Lambda | Data<br>Distribution |
|--------------------|-------------------|-------------------|--------------------|----------|-----------|----------|-----------|---------------------|---------|-----------------------|-----------------|----------------------------------|--------------|-----------------|----------------------|
|                    |                   |                   |                    | Interval | Tolerance | Interval | Tolerance |                     |         |                       | Revised<br>Mean | Revised<br>Standard<br>Deviation |              |                 |                      |
| 1 Aluminum (Al)    | 12                | 2                 | 17                 | .        | .         | .        | 2.7363    | 0.1134              | 0.0673  | .                     | .               | .                                | .            | .               | NORMAL               |
| 2 Antimony (Sb)    | 12                | 0                 | 0                  | .        | .         | .        | 2.7363    | 0.0483              | 0.0635  | .                     | .               | .                                | .            | .               | NORMAL               |
| 3 Arsenic (As)     | 9                 | 1                 | 11                 | .        | .         | .        | 3.0312    | 0.0047              | 0.0010  | .                     | .               | .                                | .            | .               | NORMAL               |
| 4 Barium (Ba)      | 12                | 1                 | 8                  | .        | .         | .        | 2.7363    | 0.0975              | 0.0086  | .                     | .               | .                                | .            | .               | NORMAL               |
| 5 Beryllium (Be)   | 12                | 0                 | 0                  | .        | .         | .        | 2.7363    | 0.0024              | 0.0004  | .                     | .               | .                                | .            | .               | NORMAL               |
| 6 Cadmium (Cd)     | 12                | 1                 | 8                  | .        | .         | .        | 2.7363    | 0.0027              | 0.0008  | .                     | .               | .                                | .            | .               | NORMAL               |
| 7 Calcium (Ca)     | 12                | 12                | 100                | .        | 131.9898  | .        | 2.7363    | 97.0962             | 12.7519 | .                     | .               | .                                | .            | .               | LOG                  |
| 8 Cesium (Cs)      | 12                | 0                 | 0                  | .        | .         | .        | 2.7363    | 0.5250              | 0.2624  | .                     | .               | .                                | .            | .               | NORMAL               |
| 9 Chromium (Cr)    | 12                | 0                 | 0                  | .        | .         | .        | 2.7363    | 0.0054              | 0.0014  | .                     | .               | .                                | .            | .               | NORMAL               |
| 10 Cobalt (Co)     | 12                | 0                 | 0                  | .        | .         | .        | 2.7363    | 0.0238              | 0.0043  | .                     | .               | .                                | .            | .               | NORMAL               |
| 11 Copper (Cu)     | 9                 | 0                 | 0                  | .        | .         | .        | 3.0312    | 0.0122              | 0.0008  | .                     | .               | .                                | .            | .               | NORMAL               |
| 12 Iron (Fe)       | 9                 | 2                 | 22                 | .        | .         | .        | 3.0312    | 0.0723              | 0.0655  | .                     | .               | .                                | .            | .               | NORMAL               |
| 13 Lead (Pb)       | 11                | 2                 | 18                 | .        | .         | .        | 2.8150    | 0.0071              | 0.0112  | .                     | .               | .                                | .            | .               | NORMAL               |
| 14 Lithium (Li)    | 12                | 7                 | 58                 | .        | 0.4115    | .        | 2.7363    | 0.1188              | 0.0795  | 0.0921                | 0.1167          | 0.02                             | 0.60         | .               | NORMAL               |
| 15 Magnesium (Mg)  | 12                | 12                | 100                | .        | 29.5500   | .        | 2.7363    | 20.5561             | 3.2868  | .                     | .               | .                                | .            | .               | LOG                  |
| 16 Manganese (Mn)  | 12                | 7                 | 58                 | .        | 0.2311    | .        | 2.7363    | 0.0600              | 0.0245  | 0.0852                | 0.0533          | 0.08                             | 0.61         | .               | LOG                  |
| 17 Mercury (Hg)    | 12                | 1                 | 8                  | .        | .         | .        | 2.7363    | 0.0001              | 0.0001  | .                     | .               | .                                | .            | .               | NORMAL               |
| 18 Molybdenum (Mo) | 12                | 0                 | 0                  | .        | .         | .        | 2.7363    | 0.0554              | 0.0645  | .                     | .               | .                                | .            | .               | NORMAL               |
| 19 Nickel (Ni)     | 12                | 0                 | 0                  | .        | .         | .        | 2.7363    | 0.0192              | 0.0029  | .                     | .               | .                                | .            | .               | NORMAL               |
| 20 Potassium (K)   | 12                | 3                 | 25                 | .        | .         | .        | 2.7363    | 3.5842              | 2.8401  | .                     | .               | .                                | .            | .               | NORMAL               |
| 21 Selenium (Se)   | 10                | 4                 | 40                 | .        | .         | .        | 2.9110    | 0.0436              | 0.0845  | .                     | .               | .                                | .            | .               | NORMAL               |
| 22 Silver (Ag)     | 9                 | 0                 | 0                  | .        | .         | .        | 3.0312    | 0.0061              | 0.0033  | .                     | .               | .                                | .            | .               | NORMAL               |
| 23 Sodium (Na)     | 12                | 12                | 100                | .        | 162.1288  | .        | 2.7363    | 99.7158             | 22.8089 | .                     | .               | .                                | .            | .               | LOG                  |
| 24 Strontium (Sr)  | 12                | 5                 | 42                 | .        | .         | .        | 2.7363    | 0.6992              | 0.4332  | .                     | .               | .                                | .            | .               | NORMAL               |
| 25 Thallium (Tl)   | 10                | 0                 | 0                  | .        | .         | .        | 2.9110    | 0.0077              | 0.0066  | .                     | .               | .                                | .            | .               | NORMAL               |
| 26 Tin (Sn)        | 12                | 0                 | 0                  | .        | .         | .        | 2.7363    | 0.0875              | 0.1299  | .                     | .               | .                                | .            | .               | NORMAL               |
| 27 Vanadium (V)    | 12                | 0                 | 0                  | .        | .         | .        | 2.7363    | 0.0233              | 0.0058  | .                     | .               | .                                | .            | .               | NORMAL               |
| 28 Zinc (Zn)       | 12                | 6                 | 50                 | .        | .         | .        | 2.7363    | 0.0234              | 0.0209  | 0.0089                | 0.0357          | 0.74                             | 1.04         | .               | NORMAL               |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values.

Tolerance Interval Calculations for Inorganic Concentrations in  
Background Colluvial Ground Water Samples  
(Concentration units mg/l except pH)

| Analyte            | No of<br>Samples | No. of<br>Detects | Percent<br>Detects | Lower                 |                       | Upper                 |                       | Tolerance<br>Factor | Mean     | Standard<br>Deviation | Cohen           |                                  | Cohen<br>Lambda | Data<br>Distrib-<br>ution |
|--------------------|------------------|-------------------|--------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|----------|-----------------------|-----------------|----------------------------------|-----------------|---------------------------|
|                    |                  |                   |                    | Tolerance<br>Interval | Tolerance<br>Interval | Tolerance<br>Interval | Tolerance<br>Interval |                     |          |                       | Revised<br>Mean | Revised<br>Standard<br>Deviation |                 |                           |
| 1 Bicarbonate      | 10               | 10                | 100                |                       | 568.1777              |                       | 2 9110                | 398 5286            | 58 2794  |                       |                 |                                  |                 | LOG                       |
| 2 Carbonate        | 10               | 0                 | 0                  | .                     |                       |                       | 2 9110                | 2 5000              | 0.0000   |                       |                 |                                  | .               | NORMAL                    |
| 3 Cyanide          | 9                | 0                 | 0                  | .                     |                       |                       | 3 0312                | 0.0029              | 0 0020   |                       |                 |                                  |                 | NORMAL                    |
| 4 Dissolved Solids | 9                | 9                 | 100                | .                     | 1337.3271             |                       | 3 0312                | 781 6701            | 183 3103 |                       |                 |                                  | .               | LOG                       |
| 5 Field pH         | 12               | 12                | 100                | 6.4986                | 8.0347                |                       | 2 7363                | 7 2667              | 0.2807   |                       |                 |                                  |                 | NORMAL                    |
| 6 Nitrate/Nitrite  | 7                | 4                 | 57                 |                       | 5.1725                |                       | 3 3995                | 0 6610              | 0 4760   |                       | 1 2723          | 1 1473                           | 0 37            | LOG                       |
| 7 Sulfate          | 10               | 10                | 100                | .                     | 296.1911              |                       | 2 9110                | 152 2558            | 49 4459  |                       |                 |                                  |                 | LOG                       |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values.

Tolerance Interval Calculations for Inorganic Concentrations in  
Background North Rocky Flats Colluvial Ground Water Samples  
(Concentration units mg/l except pH)

| <u>Analyte</u> | <u>No of<br/>Samples</u> | <u>No. of<br/>Detects</u> | <u>Percent<br/>Detects</u> | <u>Lower</u>    |                 | <u>Upper</u>    |                 | <u>Tolerance<br/>Factor</u> | <u>Tolerance<br/>Interval</u> | <u>Mean</u> | <u>Standard<br/>Deviation</u> | <u>Cohen<br/>Revised</u> |                  | <u>Cohen<br/>Tau</u> | <u>Cohen<br/>Lambda</u> | <u>Data<br/>Distrib-<br/>ution</u> |
|----------------|--------------------------|---------------------------|----------------------------|-----------------|-----------------|-----------------|-----------------|-----------------------------|-------------------------------|-------------|-------------------------------|--------------------------|------------------|----------------------|-------------------------|------------------------------------|
|                |                          |                           |                            | <u>Interval</u> | <u>Interval</u> | <u>Interval</u> | <u>Interval</u> |                             |                               |             |                               | <u>Mean</u>              | <u>Deviation</u> |                      |                         |                                    |
| 1 Chloride     | 6                        | 6                         | 100                        | .               | .               | .               | .               | 3 7077                      | 16 7937                       | 2 6773      | .                             | .                        | .                | .                    | .                       | LOG                                |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values.

Tolerance Interval Calculations for Inorganic Concentrations in  
Background South Rocky Flats Colluvial Ground Water Samples  
(Concentration units mg/l except pH)

| <u>Analyte</u> | <u>No of<br/>Samples</u> | <u>No. of<br/>Detects</u> | <u>Percent<br/>Detects</u> | <u>Lower</u>    |                 | <u>Upper</u>    |                 | <u>Tolerance<br/>Factor</u> | <u>Tolerance<br/>Mean</u> | <u>Standard<br/>Deviation</u> | <u>Cohen</u>            |   | <u>Data<br/>Distrib-<br/>ution</u> |
|----------------|--------------------------|---------------------------|----------------------------|-----------------|-----------------|-----------------|-----------------|-----------------------------|---------------------------|-------------------------------|-------------------------|---|------------------------------------|
|                |                          |                           |                            | <u>Interval</u> | <u>Interval</u> | <u>Interval</u> | <u>Interval</u> |                             |                           |                               | <u>Revised<br/>Mean</u> | <u>Revised<br/>Standard<br/>Deviation</u> |                                    |
| 1 Chloride     | 4                        | 4                         | 100                        |                 |                 |                 |                 | 5 1439                      | 18.0002                   | 0 8200                        |                         |   | LOG                                |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values.

Tolerance Interval Calculations for Dissolved Radiochemical Concentrations in  
Background Colluvial Ground Water Samples  
(Concentration units pCi/L)

| Analyte         | No. of<br>Samples | No. of<br>Detects | Percent<br>Detects | Lower    |                       | Upper    |                       | Tolerance<br>Factor | Mean | Standard<br>Deviation | Cohen Revised |           | Cohen<br>Tau | Cohen<br>Lambda | Data<br>Distrib-<br>ution |
|-----------------|-------------------|-------------------|--------------------|----------|-----------------------|----------|-----------------------|---------------------|------|-----------------------|---------------|-----------|--------------|-----------------|---------------------------|
|                 |                   |                   |                    | Interval | Tolerance<br>Interval | Interval | Tolerance<br>Interval |                     |      |                       | Mean          | Deviation |              |                 |                           |
| 1 Americium-241 | 7                 | 7                 | 100                | .        | 0 0110                | 3.3995   | -0 0017               | 0 0037              |      |                       |               |           | .            |                 | NORMAL                    |
| 2 Cesium-137    | 9                 | 9                 | 100                | .        | 0.9228                | 3.0312   | 0 0200                | 0.2978              |      |                       |               |           | .            |                 | NORMAL                    |
| 3 Gross Alpha   | 9                 | 9                 | 100                | .        | 227 6457              | 3.0312   | 35 1111               | 63.5168             |      |                       |               |           | .            |                 | NORMAL                    |
| 4 Gross Beta    | 9                 | 9                 | 100                | .        | 248.8590              | 3.0312   | 38 6222               | 69 3567             |      |                       |               |           | .            |                 | NORMAL                    |
| 5 Plutonium-239 | 7                 | 7                 | 100                |          | 0.0114                | 3.3995   | 0.0011                | 0 0030              |      |                       |               |           | .            |                 | NORMAL                    |
| 6 Radium-226    | 4                 | 4                 | 100                |          |                       | 5.1439   | 1.1250                | 1 1295              |      |                       |               |           | .            |                 | NORMAL                    |
| 7 Strontium-90  | 9                 | 9                 | 100                |          | 0 4191                | 3.0312   | 0.0222                | 0 1309              |      |                       |               |           | .            |                 | NORMAL                    |
| 8 Tritium       | 9                 | 9                 | 100                |          | 337 8201              | 3.0312   | 15.5556               | 106 3145            |      |                       |               |           | .            |                 | NORMAL                    |
| 9 Uranium-235   | 9                 | 9                 | 100                |          | 9 1104                | 3.0312   | 1 3544                | 2 5587              |      |                       |               |           | .            |                 | NORMAL                    |
| 10 Uranium-238  | 9                 | 9                 | 100                | .        | 107 8223              | 3.0312   | 18 8533               | 29 3507             |      |                       |               |           | .            |                 | NORMAL                    |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values.

Tolerance Interval Calculations for Dissolved Metal Concentrations in  
Background Valley Fill Alluvial Ground Water Samples  
(Concentration units mg/l)

| Analyte            | No. of<br>Samples | No. of<br>Detects | Percent<br>Detects | Lower<br>Tolerance<br>Interval | Upper<br>Tolerance<br>Interval | Tolerance<br>Factor | Mean    | Standard<br>Deviation | Cohen<br>Revised<br>Mean | Cohen<br>Revised<br>Standard<br>Deviation | Cohen<br>Tau | Cohen<br>Lambda | Data<br>Distrib-<br>ution |
|--------------------|-------------------|-------------------|--------------------|--------------------------------|--------------------------------|---------------------|---------|-----------------------|--------------------------|---|--------------|-----------------|---------------------------|
| 1 Aluminum (Al)    | 11                | 1                 | 9                  |                                |                                | 2.8150              | 0.0940  | 0.0198                |                          |   |              |                 | NORMAL                    |
| 2 Antimony (Sb)    | 17                | 0                 | 0                  |                                |                                | 2.4863              | 0.0429  | 0.0534                |                          |   |              |                 | NORMAL                    |
| 3 Arsenic (As)     | 17                | 0                 | 0                  |                                |                                | 2.4863              | 0.0048  | 0.0010                |                          |   |              |                 | NORMAL                    |
| 4 Barium (Ba)      | 17                | 2                 | 12                 |                                |                                | 2.4863              | 0.1076  | 0.0295                |                          |   |              |                 | NORMAL                    |
| 5 Beryllium (Be)   | 17                | 0                 | 0                  |                                |                                | 2.4863              | 0.0024  | 0.0004                |                          |   |              |                 | NORMAL                    |
| 6 Cadmium (Cd)     | 13                | 0                 | 0                  |                                |                                | 2.6705              | 0.0025  | 0.0001                |                          |   |              |                 | NORMAL                    |
| 7 Calcium (Ca)     | 17                | 17                | 100                |                                | 81.6080                        | 2.4863              | 61.1150 | 8.2425                |                          |   |              |                 | LOG                       |
| 8 Cesium (Cs)      | 10                | 0                 | 0                  |                                |                                | 2.9110              | 0.5750  | 0.2372                |                          |   |              |                 | NORMAL                    |
| 9 Chromium (Cr)    | 17                | 0                 | 0                  |                                |                                | 2.4863              | 0.0053  | 0.0012                |                          |   |              |                 | NORMAL                    |
| 10 Cobalt (Co)     | 17                | 0                 | 0                  |                                |                                | 2.4863              | 0.0241  | 0.0036                |                          |   |              |                 | NORMAL                    |
| 11 Copper (Cu)     | 10                | 1                 | 10                 |                                |                                | 2.9110              | 0.0139  | 0.0045                |                          |   |              |                 | NORMAL                    |
| 12 Iron (Fe)       | 17                | 4                 | 24                 |                                |                                | 2.4863              | 0.1772  | 0.2969                |                          |   |              |                 | NORMAL                    |
| 13 Lead (Pb)       | 17                | 1                 | 6                  |                                |                                | 2.4863              | 0.0030  | 0.0024                |                          |   |              |                 | NORMAL                    |
| 14 Lithium (Li)    | 17                | 9                 | 53                 |                                | 0.0980                         | 2.4863              | 0.0303  | 0.0183                | 0.0375                   | 0.0244                                    | 0.10         | 0.74            | NORMAL                    |
| 15 Magnesium (Mg)  | 17                | 15                | 88                 |                                | 18.1625                        | 2.4863              | 12.8978 | 2.1175                |                          |   |              |                 | LOG                       |
| 16 Manganese (Mn)  | 17                | 10                | 59                 |                                | 0.3990                         | 2.4863              | 0.0839  | 0.0365                | 0.1444                   | 0.1024                                    | 0.22         | 0.65            | LOG                       |
| 17 Mercury (Hg)    | 13                | 2                 | 15                 |                                |                                | 2.6705              | 0.0001  | 0.0001                |                          |   |              |                 | NORMAL                    |
| 18 Molybdenum (Mo) | 17                | 0                 | 0                  |                                |                                | 2.4863              | 0.0379  | 0.0590                |                          |   |              |                 | NORMAL                    |
| 19 Nickel (Ni)     | 11                | 0                 | 0                  |                                |                                | 2.8150              | 0.0191  | 0.0030                |                          |   |              |                 | NORMAL                    |
| 20 Potassium (K)   | 14                | 1                 | 7                  |                                |                                | 2.6144              | 2.4679  | 0.1203                |                          |   |              |                 | NORMAL                    |
| 21 Selenium (Se)   | 10                | 2                 | 20                 |                                |                                | 2.9110              | 0.0057  | 0.0076                |                          |   |              |                 | NORMAL                    |
| 22 Silver (Ag)     | 15                | 0                 | 0                  |                                |                                | 2.5660              | 0.0057  | 0.0026                |                          |   |              |                 | NORMAL                    |
| 23 Sodium (Na)     | 17                | 17                | 100                |                                | 47.2678                        | 2.4863              | 37.7639 | 3.8225                |                          |   |              |                 | LOG                       |
| 24 Strontium (Sr)  | 17                | 2                 | 12                 |                                |                                | 2.4863              | 0.5082  | 0.0846                |                          |   |              |                 | NORMAL                    |
| 25 Thallium (Tl)   | 17                | 0                 | 0                  |                                |                                | 2.4863              | 0.0145  | 0.0077                |                          |   |              |                 | NORMAL                    |
| 26 Tin (Sn)        | 17                | 0                 | 0                  |                                |                                | 2.4863              | 0.0765  | 0.1091                |                          |   |              |                 | NORMAL                    |
| 27 Vanadium (V)    | 17                | 0                 | 0                  |                                |                                | 2.4863              | 0.0238  | 0.0049                |                          |   |              |                 | NORMAL                    |
| 28 Zinc (Zn)       | 17                | 5                 | 29                 |                                |                                | 2.4863              | 0.0207  | 0.0237                |                          |   |              |                 | NORMAL                    |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values.

Tolerance Interval Calculations for Inorganic Concentrations in  
Background Valley Fill Alluvial Ground Water Samples  
(Concentration units mg/l except pH)

| Analyte            | No of<br>Samples | No. of<br>Detects | Percent<br>Detects | Lower                 |                       | Upper                 |          | Tolerance<br>Factor | Standard<br>Deviation | Cohen<br>Revised<br>Mean | Cohen<br>Revised<br>Standard<br>Deviation | Cohen<br>Tau | Cohen<br>Lambda | Data<br>Distrib-<br>ution |
|--------------------|------------------|-------------------|--------------------|-----------------------|-----------------------|-----------------------|----------|---------------------|-----------------------|--------------------------|---|--------------|-----------------|---------------------------|
|                    |                  |                   |                    | Tolerance<br>Interval | Tolerance<br>Interval | Tolerance<br>Interval | Mean     |                     |                       |                          |   |              |                 |                           |
| 1 Bicarbonate      | 21               | 21                | 100                |                       | 350.6604              | 2 3714                | 277 9386 | 30 6659             |                       |                          |   |              |                 | LOG                       |
| 2 Carbonate        | 21               | 0                 | 0                  |                       |                       | 2 3714                | 2 5000   | 0 0000              |                       |                          |   |              |                 | NORMAL                    |
| 3 Cyanide          | 16               | 0                 | 0                  |                       |                       | 2 5237                | 0 0027   | 0 0019              |                       |                          |   |              |                 | NORMAL                    |
| 4 Dissolved Solids | 21               | 21                | 100                |                       | 651 6990              | 2 3714                | 484 1310 | 70 6614             |                       |                          |   |              |                 | LOG                       |
| 5 Field pH         | 21               | 21                | 100                | 6 4361                | 7.9067                | 2 3714                | 7 1714   | 0 3101              |                       |                          |   |              |                 | NORMAL                    |
| 6 Nitrate/Nitrite  | 21               | 11                | 52                 | .                     | 2.6803                | 2 3714                | 0 3636   | 0 1720              | 0 9020                | 0 7499                   | 0 19                                      | 0 77         |                 | LOG                       |
| 7 Sulfate          | 21               | 21                | 100                | .                     | 175 2758              | 2 3714                | 107 3990 | 28 6228             |                       |                          |   |              |                 | LOG                       |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values.

Tolerance Interval Calculations for Inorganic Concentrations in  
Background North Rocky Flats Valley Fill Alluvial Ground Water Samples  
(Concentration units mg/l except pH)

| Analyte    | No. of<br>Samples | No of<br>Detects | Percent<br>Detects | Lower                 |          | Upper                 |          | Tolerance<br>Factor | Mean   | Standard<br>Deviation | Cohen<br>Revised |           | Cohen<br>Lambda | Data<br>Distrib-<br>ution |
|------------|-------------------|------------------|--------------------|-----------------------|----------|-----------------------|----------|---------------------|--------|-----------------------|------------------|-----------|-----------------|---------------------------|
|            |                   |                  |                    | Tolerance<br>Interval | Interval | Tolerance<br>Interval | Interval |                     |        |                       | Mean             | Deviation | Iau             |                           |
| 1 Chloride | 12                | 11               | 92                 | .                     |          | 11.3029               | 2.7363   | 7 9800              | 1.2144 |                       |                  |           |                 | LOG                       |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values.

Tolerance Interval Calculations for Inorganic Concentrations in  
Background South Rocky Flats Valley Fill Alluvial Ground Water Samples  
(Concentration units mg/l except pH)

| <u>Analyte</u> | <u>No of<br/>Samples</u> | <u>No of<br/>Detects</u> | <u>Percent<br/>Detects</u> | <u>Lower</u>                  |                 | <u>Upper</u>                  |                 | <u>Tolerance<br/>Factor</u> | <u>Mean</u> | <u>Standard<br/>Deviation</u> | <u>Cohen<br/>Revised</u> |                  | <u>Cohen<br/>Tau</u> | <u>Cohen<br/>Lambda</u> | <u>Data<br/>Distrib-<br/>ution</u> |
|----------------|--------------------------|--------------------------|----------------------------|-------------------------------|-----------------|-------------------------------|-----------------|-----------------------------|-------------|-------------------------------|--------------------------|------------------|----------------------|-------------------------|------------------------------------|
|                |                          |                          |                            | <u>Tolerance<br/>Interval</u> | <u>Interval</u> | <u>Tolerance<br/>Interval</u> | <u>Interval</u> |                             |             |                               | <u>Mean</u>              | <u>Deviation</u> |                      |                         |                                    |
| 1 Chloride     | 9                        | 9                        | 100                        |                               |                 | 63 3271                       |                 | 3 0312                      | 36.8487     | 8 7352                        |                          |                  |                      |                         | LOG                                |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values.

Tolerance Interval Calculations for Dissolved Radiochemical Concentrations in  
Background Valley Fill Alluvial Ground Water Samples  
(Concentration units pCi/l)

| Analyte         | No. of<br>Samples | No. of<br>Detects | Percent<br>Detects | Lower<br>Tolerance<br>Interval | Upper<br>Tolerance<br>Interval | Tolerance<br>Factor | Mean    | Standard<br>Deviation | Cohen<br>Revised<br>Mean | Cohen<br>Revised<br>Standard<br>Deviation | Cohen<br>Tau | Cohen<br>Lambda | Data<br>Distrib-<br>ution |
|-----------------|-------------------|-------------------|--------------------|--------------------------------|--------------------------------|---------------------|---------|-----------------------|--------------------------|---|--------------|-----------------|---------------------------|
| 1 Americium-241 | 14                | 14                | 100                | .                              | 0.0094                         | 2.6144              | -0.0029 | 0.0047                | .                        | .   | .            | .               | NORMAL                    |
| 2 Cesium-137    | 19                | 19                | 100                | .                              | 0.4474                         | 2.4230              | -0.0047 | 0.1866                | .                        | .   | .            | .               | NORMAL                    |
| 3 Gross Alpha   | 19                | 19                | 100                | .                              | 10.5809                        | 2.4230              | 3.8316  | 2.7855                | .                        | .   | .            | .               | NORMAL                    |
| 4 Gross Beta    | 19                | 19                | 100                | .                              | 11.9209                        | 2.4230              | 5.0526  | 2.8346                | .                        | .   | .            | .               | NORMAL                    |
| 5 Plutonium-239 | 18                | 18                | 100                | .                              | 0.0223                         | 2.4529              | 0.0038  | 0.0075                | .                        | .   | .            | .               | NORMAL                    |
| 6 Radium-226    | 3                 | 3                 | 100                | .                              | .                              | 7.6559              | 0.1333  | 0.2082                | .                        | .   | .            | .               | NORMAL                    |
| 7 Strontium-90  | 19                | 19                | 100                | .                              | 1.1843                         | 2.4230              | 0.2721  | 0.3765                | .                        | .   | .            | .               | NORMAL                    |
| 8 Tritium       | 20                | 20                | 100                | .                              | 511.5681                       | 2.3960              | 89.0000 | 176.3639              | .                        | .   | .            | .               | NORMAL                    |
| 9 Uranium-235   | 19                | 19                | 100                | .                              | 0.3082                         | 2.4230              | 0.0968  | 0.0872                | .                        | .   | .            | .               | NORMAL                    |
| 10 Uranium-238  | 19                | 19                | 100                | .                              | 5.1501                         | 2.4230              | 1.5274  | 1.4951                | .                        | .   | .            | .               | NORMAL                    |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values.

Tolerance Interval Calculations for Dissolved Metal Concentrations in  
Background Weathered Claystone Ground Water Samples  
(Concentration units mg/l)

| Analyte           | No. of<br>Samples | No. of<br>Detects | Percent<br>Detects | Lower                 |                       | Upper                 |                       | Tolerance<br>Factor | Mean    | Standard<br>Deviation | Cohen           |                                  | Cohen<br>Tau | Cohen<br>Lambda | Data<br>Distrib-<br>ution |
|-------------------|-------------------|-------------------|--------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|---------|-----------------------|-----------------|----------------------------------|--------------|-----------------|---------------------------|
|                   |                   |                   |                    | Tolerance<br>Interval | Tolerance<br>Interval | Tolerance<br>Interval | Tolerance<br>Interval |                     |         |                       | Revised<br>Mean | Revised<br>Standard<br>Deviation |              |                 |                           |
| 1 Aluminum (Al)   | 15                | 2                 | 13                 | .                     | .                     | .                     | .                     | 2.5660              | 0.0933  | 0.0181                | .               | .                                | .            | .               | NORMAL                    |
| 2 Antimony (Sb)   | 16                | 0                 | 0                  | .                     | .                     | .                     | .                     | 2.5237              | 0.0575  | 0.0751                | .               | .                                | .            | .               | NORMAL                    |
| 3 Arsenic (As)    | 16                | 1                 | 6                  | .                     | .                     | .                     | .                     | 2.5237              | 0.0043  | 0.0015                | .               | .                                | .            | .               | NORMAL                    |
| 4 Barium (Ba)     | 16                | 1                 | 6                  | .                     | .                     | .                     | .                     | 2.5237              | 0.0953  | 0.0188                | .               | .                                | .            | .               | NORMAL                    |
| 5 Beryllium (Be)  | 16                | 0                 | 0                  | .                     | .                     | .                     | .                     | 2.5237              | 0.0023  | 0.0005                | .               | .                                | .            | .               | NORMAL                    |
| 6 Cadmium (Cd)    | 15                | 0                 | 0                  | .                     | .                     | .                     | .                     | 2.5660              | 0.0024  | 0.0002                | .               | .                                | .            | .               | NORMAL                    |
| 7 Calcium (Ca)    | 16                | 16                | 100                | .                     | .                     | .                     | 76.7449               | 2.5237              | 58.8797 | 7.0791                | .               | .                                | .            | .               | LOG                       |
| 8 Cesium (Cs)     | 16                | 0                 | 0                  | .                     | .                     | .                     | .                     | 2.5237              | 0.6406  | 0.3023                | .               | .                                | .            | .               | NORMAL                    |
| 9 Chromium (Cr)   | 16                | 0                 | 0                  | .                     | .                     | .                     | .                     | 2.5237              | 0.0056  | 0.0017                | .               | .                                | .            | .               | NORMAL                    |
| 10 Cobalt (Co)    | 15                | 0                 | 0                  | .                     | .                     | .                     | .                     | 2.5660              | 0.0230  | 0.0053                | .               | .                                | .            | .               | NORMAL                    |
| 11 Copper (Cu)    | 16                | 2                 | 13                 | .                     | .                     | .                     | .                     | 2.5237              | 0.0168  | 0.0118                | .               | .                                | .            | .               | NORMAL                    |
| 12 Iron (Fe)      | 15                | 2                 | 13                 | .                     | .                     | .                     | .                     | 2.5660              | 0.0549  | 0.0130                | .               | .                                | .            | .               | NORMAL                    |
| 13 Lead (Pb)      | 14                | 3                 | 21                 | .                     | .                     | .                     | .                     | 2.6144              | 0.0024  | 0.0011                | .               | .                                | .            | .               | NORMAL                    |
| 14 Lithium (Li)   | 16                | 5                 | 31                 | .                     | .                     | .                     | .                     | 2.5237              | 0.0753  | 0.1062                | .               | .                                | .            | .               | NORMAL                    |
| 15 Magnesium (Mg) | 16                | 16                | 100                | .                     | .                     | .                     | 33.2559               | 2.5237              | 20.0602 | 5.2288                | 0.1723          | 0.1077                           | 0.18         | 0.43            | LOG                       |
| 16 Manganese (Mn) | 16                | 11                | 69                 | .                     | .                     | .                     | 0.4441                | 2.5237              | 0.1182  | 0.0528                | .               | .                                | .            | .               | LOG                       |
| 17 Mercury (Hg)   | 16                | 4                 | 25                 | .                     | .                     | .                     | .                     | 2.5237              | 0.0002  | 0.0002                | .               | .                                | .            | .               | NORMAL                    |
| 18 Molybdenum(Mo) | 16                | 2                 | 13                 | .                     | .                     | .                     | .                     | 2.5237              | 0.0677  | 0.0728                | .               | .                                | .            | .               | NORMAL                    |
| 19 Nickel (Ni)    | 12                | 0                 | 0                  | .                     | .                     | .                     | .                     | 2.7363              | 0.0183  | 0.0039                | .               | .                                | .            | .               | NORMAL                    |
| 20 Potassium (K)  | 15                | 3                 | 20                 | .                     | .                     | .                     | .                     | 2.5660              | 2.6393  | 0.7661                | .               | .                                | .            | .               | NORMAL                    |
| 21 Selenium (Se)  | 15                | 3                 | 20                 | .                     | .                     | .                     | .                     | 2.5660              | 0.0095  | 0.0171                | .               | .                                | .            | .               | NORMAL                    |
| 22 Silver (Ag)    | 16                | 0                 | 0                  | .                     | .                     | .                     | .                     | 2.5237              | 0.0063  | 0.0034                | .               | .                                | .            | .               | NORMAL                    |
| 23 Sodium (Na)    | 16                | 16                | 100                | .                     | .                     | .                     | 99.6049               | 2.5237              | 57.0263 | 16.8718               | .               | .                                | .            | .               | LOG                       |
| 24 Strontium (Sr) | 16                | 7                 | 44                 | .                     | .                     | .                     | .                     | 2.5237              | 0.8971  | 1.6735                | .               | .                                | .            | .               | NORMAL                    |
| 25 Thallium (Tl)  | 16                | 1                 | 6                  | .                     | .                     | .                     | .                     | 2.5237              | 0.0059  | 0.0055                | .               | .                                | .            | .               | NORMAL                    |
| 26 Tin (Sn)       | 16                | 0                 | 0                  | .                     | .                     | .                     | .                     | 2.5237              | 0.1344  | 0.1814                | .               | .                                | .            | .               | NORMAL                    |
| 27 Vanadium (V)   | 16                | 0                 | 0                  | .                     | .                     | .                     | .                     | 2.5237              | 0.0225  | 0.0068                | .               | .                                | .            | .               | NORMAL                    |
| 28 Zinc (Zn)      | 13                | 9                 | 69                 | .                     | .                     | .                     | 0.1241                | 2.6705              | 0.0329  | 0.0278                | 0.0259          | 0.0367                           | 0.71         | 0.52            | NORMAL                    |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values.

Tolerance Interval Calculations for Inorganic Concentrations in  
Background Weathered Claystone Ground Water Samples  
(Concentration units mg/l except pH)

| Analyte            | No of<br>Samples | No of<br>Detects | Percent<br>Detects | Lower                 |                       | Upper                 |                       | Tolerance<br>Factor | Mean | Standard<br>Deviation | Cohen<br>Revised |                       | Cohen<br>Tau | Cohen<br>Lambda | Data<br>Distrib-<br>ution |
|--------------------|------------------|------------------|--------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|------|-----------------------|------------------|-----------------------|--------------|-----------------|---------------------------|
|                    |                  |                  |                    | Tolerance<br>Interval | Tolerance<br>Interval | Tolerance<br>Interval | Tolerance<br>Interval |                     |      |                       | Mean             | Standard<br>Deviation |              |                 |                           |
| 1 Bicarbonate      | 12               | 12               | 100                |                       | 298.4996              | 2 7363                | 235.7107              | 22 9463             |      |                       |                  |                       |              |                 | LOG                       |
| 2 Carbonate        | 12               | 0                | 0                  |                       | .                     | 2 7363                | 2.5000                | 0 0000              |      |                       |                  |                       |              |                 | NORMAL                    |
| 3 Cyanide          | 14               | 1                | 7                  |                       |                       | 2 6144                | 0 0033                | 0 0019              |      |                       | .                | .                     |              |                 | NORMAL                    |
| 4 Dissolved Solids | 12               | 12               | 100                |                       | 309 6985              | 2 7363                | 263 3022              | 16 9556             |      |                       | .                | .                     |              |                 | LOG                       |
| 5 Field pH         | 18               | 18               | 100                | 6 6168                | 8.6888                | 2 4529                | 7 6528                | 0 4223              |      |                       |                  | .                     |              |                 | NORMAL                    |
| 6 Nitrate/Nitrite  | 13               | 12               | 92                 |                       | 0 6143                | 2 6705                | 0.3413                | 0.1022              |      |                       |                  |                       |              |                 | LOG                       |
| 7 Sulfate          | 12               | 12               | 100                |                       | 49.3145               | 2 7363                | 33.4302               | 5 8049              |      |                       |                  |                       |              |                 | LOG                       |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values

Tolerance Interval Calculations for Inorganic Concentrations in  
 Background North Rocky Flats Weathered Claystone Ground Water Samples  
 (Concentration units mg/l except pH)

| <u>Analyte</u> | <u>No of<br/>Samples</u> | <u>No. of<br/>Detects</u> | <u>Percent<br/>Detects</u> | <u>Lower</u>                  |                 | <u>Upper</u>                  |                 | <u>Tolerance<br/>Factor</u> | <u>Mean</u> | <u>Standard<br/>Deviation</u> | <u>Cohen<br/>Revised</u> |                  | <u>Cohen<br/>Tau</u> | <u>Cohen<br/>Lambda</u> | <u>Data<br/>Distrib-<br/>ution</u> |
|----------------|--------------------------|---------------------------|----------------------------|-------------------------------|-----------------|-------------------------------|-----------------|-----------------------------|-------------|-------------------------------|--------------------------|------------------|----------------------|-------------------------|------------------------------------|
|                |                          |                           |                            | <u>Tolerance<br/>Interval</u> | <u>Interval</u> | <u>Tolerance<br/>Interval</u> | <u>Interval</u> |                             |             |                               | <u>Mean</u>              | <u>Deviation</u> |                      |                         |                                    |
| 1 Chloride     | 6                        | 1                         | 17                         |                               |                 |                               |                 | 3 7077                      | 1 8872      | 0 3083                        | .                        | .                | .                    | .                       | LOG                                |

NORMAL=Normal data distribution assumed    LOG=Log normal data distribution assumed    . = result is not applicable  
 Statistics for log normal distributions are presented as untransformed (antilog) values.

Tolerance Interval Calculations for Inorganic Concentrations in  
Background South Rocky Flats Weathered Claystone Ground Water Samples  
(Concentration units mg/l except pH)

| <u>Analyte</u> | <u>No. of<br/>Samples</u> | <u>No of<br/>Detects</u> | <u>Percent<br/>Detects</u> | <u>Lower</u>                  |                 | <u>Upper</u>                  |                 | <u>Tolerance<br/>Factor</u> | <u>Mean</u> | <u>Standard<br/>Deviation</u> | <u>Cohen<br/>Revised</u> |                  | <u>Cohen<br/>Tau</u> | <u>Cohen<br/>Lambda</u> | <u>Data<br/>Distrib-<br/>ution</u> |
|----------------|---------------------------|--------------------------|----------------------------|-------------------------------|-----------------|-------------------------------|-----------------|-----------------------------|-------------|-------------------------------|--------------------------|------------------|----------------------|-------------------------|------------------------------------|
|                |                           |                          |                            | <u>Tolerance<br/>Interval</u> | <u>Interval</u> | <u>Tolerance<br/>Interval</u> | <u>Interval</u> |                             |             |                               | <u>Mean</u>              | <u>Deviation</u> |                      |                         |                                    |
| 1 Chloride     | 6                         | 5                        | 83                         | .                             | .               | .                             | .               | 3 7077                      | 12.2801     | 4 7805                        | 12 4599                  | 5.1094           | 0 06                 | 0 18                    | LOG                                |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values

Tolerance Interval Calculations for Dissolved Radiochemical Concentrations in  
Background Weathered Claystone Ground Water Samples  
(Concentration units pCi/l)

| Analyte         | No of<br>Samples | No. of<br>Detects | Percent<br>Detects | Lower                 |                       | Upper                 |                       | Tolerance<br>Factor | Mean    | Standard<br>Deviation | Cohen<br>Revised |                       | Cohen<br>Tau | Cohen<br>Lambda | Data<br>Distrib-<br>ution |
|-----------------|------------------|-------------------|--------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|---------|-----------------------|------------------|-----------------------|--------------|-----------------|---------------------------|
|                 |                  |                   |                    | Tolerance<br>Interval | Tolerance<br>Interval | Tolerance<br>Interval | Tolerance<br>Interval |                     |         |                       | Mean             | Standard<br>Deviation |              |                 |                           |
| 1 Americium-241 | 10               | 10                | 100                |                       |                       | 0.0347                | 2 9110                |                     | 0.0034  | 0.0108                | .                | .                     | .            | .               | NORMAL                    |
| 2 Cesium-137    | 13               | 13                | 100                | .                     | .                     | 0 5916                | 2 6705                |                     | 0 1046  | 0 1824                | .                | .                     | .            | .               | NORMAL                    |
| 3 Gross Alpha   | 13               | 13                | 100                |                       |                       | 24.9838               | 2 6705                |                     | 7.7000  | 6 4721                | .                | .                     | .            | .               | NORMAL                    |
| 4 Gross Beta    | 13               | 13                | 100                | .                     | .                     | 13 2977               | 2 6705                |                     | 5 4846  | 2.9257                | .                | .                     | .            | .               | NORMAL                    |
| 5 Plutonium-239 | 11               | 11                | 100                | .                     | .                     | 0.0305                | 2 8150                |                     | 0.0044  | 0.0093                | .                | .                     | .            | .               | NORMAL                    |
| 6 Radium-226    | 6                | 6                 | 100                | .                     | .                     |                       | 3 7077                |                     | 0 4817  | 0.1497                | .                | .                     | .            | .               | NORMAL                    |
| 7 Strontium-90  | 13               | 13                | 100                | .                     | .                     | 0 6422                | 2 6705                |                     | 0 0462  | 0.2232                | .                | .                     | .            | .               | NORMAL                    |
| 8 Tritium       | 19               | 19                | 100                |                       |                       | 291.8227              | 2 4230                |                     | 40 8421 | 103 5810              | .                | .                     | .            | .               | NORMAL                    |
| 9 Uranium-235   | 15               | 15                | 100                | .                     | .                     | 0.3693                | 2 5660                |                     | 0 1140  | 0.0995                | .                | .                     | .            | .               | NORMAL                    |
| 10 Uranium-238  | 15               | 15                | 100                |                       |                       | 5.2006                | 2 5660                |                     | 1 9533  | 1 2655                | .                | .                     | .            | .               | NORMAL                    |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values.

Tolerance Interval Calculations for Dissolved Metal Concentrations in  
Background Weathered Sandstone Ground Water Samples  
(Concentration units mg/l)

| Analyte           | No of<br>Samples | No. of<br>Defects | Percent<br>Defects | Lower<br>Tolerance<br>Interval | Upper<br>Tolerance<br>Interval | Tolerance<br>Factor | Mean    | Standard<br>Deviation | Cohen<br>Revised<br>Mean | Cohen<br>Revised<br>Standard<br>Deviation | Cohen<br>Tau | Cohen<br>Lambda | Data<br>Distrib-<br>ution |
|-------------------|------------------|-------------------|--------------------|--------------------------------|--------------------------------|---------------------|---------|-----------------------|--------------------------|---|--------------|-----------------|---------------------------|
| 1 Aluminum (Al)   | 6                | 0                 | 0                  | .                              | .                              | 3 7077              | 0.1000  | 0.0000                | .                        | .   | .            | .               | NORMAL                    |
| 2 Antimony (Sb)   | 4                | 1                 | 25                 | .                              | .                              | 5 1439              | 0 0665  | 0 0730                | .                        | .   | .            | .               | NORMAL                    |
| 3 Arsenic (As)    | 4                | 0                 | 0                  | .                              | .                              | 5 1439              | 0 0050  | 0.0000                | .                        | .   | .            | .               | NORMAL                    |
| 4 Barium (Ba)     | 5                | 0                 | 0                  | .                              | .                              | 4 2027              | 0.1000  | 0 0000                | .                        | .   | .            | .               | NORMAL                    |
| 5 Beryllium (Be)  | 4                | 0                 | 0                  | .                              | .                              | 5 1439              | 0 0025  | 0.0000                | .                        | .   | .            | .               | NORMAL                    |
| 6 Cadmium (Cd)    | 5                | 0                 | 0                  | .                              | .                              | 4 2027              | 0.0025  | 0 0000                | .                        | .   | .            | .               | NORMAL                    |
| 7 Calcium (Ca)    | 6                | 6                 | 100                | .                              | .                              | 3 7077              | 46.0332 | 5 8860                | .                        | .   | .            | .               | LOG                       |
| 8 Cesium (Cs)     | 6                | 0                 | 0                  | .                              | .                              | 3 7077              | 0.6250  | 0.3062                | .                        | .   | .            | .               | NORMAL                    |
| 9 Chromium (Cr)   | 5                | 1                 | 20                 | .                              | .                              | 4 2027              | 0.0064  | 0 0032                | .                        | .   | .            | .               | NORMAL                    |
| 10 Cobalt (Co)    | 5                | 0                 | 0                  | .                              | .                              | 4 2027              | 0 0250  | 0 0000                | .                        | .   | .            | .               | NORMAL                    |
| 11 Copper (Cu)    | 5                | 0                 | 0                  | .                              | .                              | 4 2027              | 0.0125  | 0.0000                | .                        | .   | .            | .               | NORMAL                    |
| 12 Iron (Fe)      | 6                | 0                 | 0                  | .                              | .                              | 3 7077              | 0.0500  | 0 0000                | .                        | .   | .            | .               | NORMAL                    |
| 13 Lead (Pb)      | 5                | 0                 | 0                  | .                              | .                              | 4 2027              | 0 0025  | 0.0000                | .                        | .   | .            | .               | NORMAL                    |
| 14 Lithium (Li)   | 6                | 2                 | 33                 | .                              | .                              | 3 7077              | 0 3334  | 0.7137                | .                        | .   | .            | .               | NORMAL                    |
| 15 Magnesium (Mg) | 6                | 6                 | 100                | .                              | .                              | 3 7077              | 7 3261  | 0 7506                | .                        | .   | .            | .               | LOG                       |
| 16 Manganese (Mn) | 6                | 5                 | 83                 | .                              | .                              | 3 7077              | 0 1017  | 0.0596                | 0 1124                   | 0.0722                                    | 0.46         | 0 22            | LOG                       |
| 17 Mercury (Hg)   | 5                | 0                 | 0                  | .                              | .                              | 4 2027              | 0.0001  | 0.0000                | .                        | .   | .            | .               | NORMAL                    |
| 18 Molybdenum(Mo) | 6                | 1                 | 17                 | .                              | .                              | 3 7077              | 0.0442  | 0 0143                | .                        | .   | .            | .               | NORMAL                    |
| 19 Nickel (Ni)    | 6                | 0                 | 0                  | .                              | .                              | 3 7077              | 0 0200  | 0 0000                | .                        | .   | .            | .               | NORMAL                    |
| 20 Potassium (K)  | 5                | 1                 | 20                 | .                              | .                              | 4 2027              | 4.0400  | 3.4435                | .                        | .   | .            | .               | NORMAL                    |
| 21 Selenium (Se)  | 4                | 0                 | 0                  | .                              | .                              | 5 1439              | 0.0025  | 0.0000                | .                        | .   | .            | .               | NORMAL                    |
| 22 Silver (Ag)    | 5                | 0                 | 0                  | .                              | .                              | 4 2027              | 0.0050  | 0 0000                | .                        | .   | .            | .               | NORMAL                    |
| 23 Sodium (Na)    | 6                | 6                 | 100                | .                              | .                              | 3.7077              | 20.4354 | 2.6519                | .                        | .   | .            | .               | LOG                       |
| 24 Strontium (Sr) | 6                | 2                 | 33                 | .                              | .                              | 3 7077              | 0 7197  | 0 6475                | .                        | .   | .            | .               | NORMAL                    |
| 25 Thallium (Tl)  | 6                | 0                 | 0                  | .                              | .                              | 3 7077              | 0 0083  | 0 0082                | .                        | .   | .            | .               | NORMAL                    |
| 26 Tin (Sn)       | 6                | 0                 | 0                  | .                              | .                              | 3 7077              | 0 0500  | 0 0000                | .                        | .   | .            | .               | NORMAL                    |
| 27 Vanadium (V)   | 6                | 0                 | 0                  | .                              | .                              | 3.7077              | 0.0250  | 0.0000                | .                        | .   | .            | .               | NORMAL                    |
| 28 Zinc (Zn)      | 6                | 1                 | 17                 | .                              | .                              | 3 7077              | 0 0126  | 0 0065                | .                        | .   | .            | .               | NORMAL                    |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values.

Tolerance Interval Calculations for Inorganic Concentrations in  
Background Weathered Sandstone Ground Water Samples  
(Concentration units mg/l except pH)

| Analyte            | No. of<br>Samples | No. of<br>Detects | Percent<br>Detects | Lower                 |          | Upper                 |          | Tolerance<br>Factor | Mean     | Standard<br>Deviation | Cohen<br>Revised |                       | Cohen<br>Tau | Cohen<br>Lambda | Data<br>Distrib-<br>ution |
|--------------------|-------------------|-------------------|--------------------|-----------------------|----------|-----------------------|----------|---------------------|----------|-----------------------|------------------|-----------------------|--------------|-----------------|---------------------------|
|                    |                   |                   |                    | Tolerance<br>Interval | Interval | Tolerance<br>Interval | Interval |                     |          |                       | Mean             | Standard<br>Deviation |              |                 |                           |
| 1 Bicarbonate      | 7                 | 7                 | 100                | .                     | .        | 236 8072              | .        | 3 3995              | 175.5991 | 18.0052               | .                | .                     | .            | .               | LOG                       |
| 2 Carbonate        | 7                 | 0                 | 0                  | .                     | .        | .                     | .        | 3 3995              | 2 5000   | 0.0000                | .                | .                     | .            | .               | NORMAL                    |
| 3 Cyanide          | 6                 | 0                 | 0                  | .                     | .        | .                     | .        | 3 7077              | 0 0025   | 0 0019                | .                | .                     | .            | .               | NORMAL                    |
| 4 Dissolved Solids | 7                 | 7                 | 100                | .                     | .        | 284 0958              | .        | 3 3995              | 212.5672 | 21.0411               | .                | .                     | .            | .               | LOG                       |
| 5 Field pH         | 8                 | 8                 | 100                | 5 6674                | 5 6674   | 8.8076                | 8.8076   | 3.1873              | 7 2375   | 0.4926                | .                | .                     | .            | .               | NORMAL                    |
| 6 Nitrate/Nitrite  | 7                 | 7                 | 100                | .                     | .        | 2.1648                | 2.1648   | 3 3995              | 0 9473   | 0 3581                | .                | .                     | .            | .               | LOG                       |
| 7 Sulfate          | 7                 | 7                 | 100                | .                     | .        | 39.1245               | 39.1245  | 3 3995              | 23.7154  | 4.5328                | .                | .                     | .            | .               | LOG                       |

NORMAL=Normal data distribution assumed    LOG=Log normal data distribution assumed    = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values

Tolerance Interval Calculations for Inorganic Concentrations in  
Background South Rocky Flats Weathered Sandstone Ground Water Samples  
(Concentration units mg/l except pH)

| <u>Analyte</u> | <u>No of<br/>Samples</u> | <u>No. of<br/>Detects</u> | <u>Percent<br/>Detects</u> | <u>Lower</u>                  |                 | <u>Upper</u>                  |                 | <u>Tolerance<br/>Factor</u> | <u>Mean</u> | <u>Standard<br/>Deviation</u> | <u>Cohen<br/>Revised</u> |                  | <u>Cohen<br/>Tau</u> | <u>Cohen<br/>Lambda</u> | <u>Data<br/>Distrib-<br/>ution</u> |
|----------------|--------------------------|---------------------------|----------------------------|-------------------------------|-----------------|-------------------------------|-----------------|-----------------------------|-------------|-------------------------------|--------------------------|------------------|----------------------|-------------------------|------------------------------------|
|                |                          |                           |                            | <u>Tolerance<br/>Interval</u> | <u>Interval</u> | <u>Tolerance<br/>Interval</u> | <u>Interval</u> |                             |             |                               | <u>Mean</u>              | <u>Deviation</u> |                      |                         |                                    |
| 1 Chloride     | 7                        | 7                         | 100                        | .                             | .               | 17 2107                       | 3 3995          | 10 2500                     | 2.0476      |                               |                          |                  |                      |                         | LOG                                |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values.

Tolerance Interval Calculations for Dissolved Radiochemical Concentrations in  
Background Weathered Sandstone Ground Water Samples  
(Concentration units pCi/L)

| Analyte         | No of<br>Samples | No. of<br>Detects | Percent<br>Detects | Lower<br>Tolerance<br>Interval | Upper<br>Tolerance<br>Interval | Tolerance<br>Factor | Mean    | Standard<br>Deviation | Cohen<br>Revised<br>Mean | Cohen<br>Revised<br>Standard<br>Deviation | Cohen<br>Tau | Cohen<br>Lambda | Data<br>Distrib-<br>ution |
|-----------------|------------------|-------------------|--------------------|--------------------------------|--------------------------------|---------------------|---------|-----------------------|--------------------------|---|--------------|-----------------|---------------------------|
| 1 Americium-241 | 7                | 7                 | 100                |                                | 0.0263                         | 3 3995              | 0 0046  | 0.0064                |                          |   |              |                 | NORMAL                    |
| 2 Cesium-137    | 8                | 8                 | 100                |                                | 0.9777                         | 3 1873              | -0.0313 | 0.3166                |                          |   |              |                 | NORMAL                    |
| 3 Gross Alpha   | 8                | 8                 | 100                |                                | 12 7000                        | 3 1873              | 3 9125  | 2 7570                |                          |   |              |                 | NORMAL                    |
| 4 Gross Beta    | 8                | 8                 | 100                |                                | 5.6214                         | 3 1873              | 1 9250  | 1.1597                |                          |   |              |                 | NORMAL                    |
| 5 Plutonium-239 | 8                | 8                 | 100                |                                | 0.0159                         | 3 1873              | 0.0030  | 0.0040                |                          |   |              |                 | NORMAL                    |
| 6 Radium-226    | 3                | 3                 | 100                |                                |                                | 7 6559              | 0 3667  | 0 0577                |                          |   |              |                 | NORMAL                    |
| 7 Strontium-90  | 8                | 8                 | 100                |                                | 0 9394                         | 3 1873              | 0.1125  | 0 2594                |                          |   |              |                 | NORMAL                    |
| 8 Tritium       | 8                | 8                 | 100                |                                | 235.1185                       | 3 1873              | 1.2500  | 73.3753               |                          |   |              |                 | NORMAL                    |
| 9 Uranium-235   | 8                | 8                 | 100                |                                | 0 2170                         | 3 1873              | 0 0188  | 0 0622                |                          |   |              |                 | NORMAL                    |
| 10 Uranium-238  | 8                | 8                 | 100                |                                | 1.0706                         | 3 1873              | 0.3500  | 0 2261                |                          |   |              |                 | NORMAL                    |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (anti(log) values.

Tolerance Interval Calculations for Dissolved Metal Concentrations in  
Background Unweathered Sandstone Ground Water Samples  
(Concentration units mg/l)

| Analyte           | No. of<br>Samples | No. of<br>Detects | Percent<br>Detects | Lower                 |          | Upper                 |          | Tolerance<br>Factor | Mean     | Standard<br>Deviation | Cohen<br>Revised |                       | Cohen<br>Tau | Cohen<br>Lambda | Data<br>Distribution |
|-------------------|-------------------|-------------------|--------------------|-----------------------|----------|-----------------------|----------|---------------------|----------|-----------------------|------------------|-----------------------|--------------|-----------------|----------------------|
|                   |                   |                   |                    | Tolerance<br>Interval | Interval | Tolerance<br>Interval | Interval |                     |          |                       | Mean             | Standard<br>Deviation |              |                 |                      |
| 1 Aluminum (Al)   | 13                | 1                 | 8                  | .                     | .        | .                     | .        | 2.6705              | 0.1109   | 0.0690                | .                | .                     | .            | .               | NORMAL               |
| 2 Antimony (Sb)   | 19                | 0                 | 0                  | .                     | .        | .                     | .        | 2.4230              | 0.0647   | 0.0824                | .                | .                     | .            | .               | NORMAL               |
| 3 Arsenic (As)    | 20                | 3                 | 15                 | .                     | .        | .                     | .        | 2.3960              | 0.0055   | 0.0036                | .                | .                     | .            | .               | NORMAL               |
| 4 Barium (Ba)     | 20                | 2                 | 10                 | .                     | .        | .                     | .        | 2.3960              | 0.0947   | 0.0171                | .                | .                     | .            | .               | NORMAL               |
| 5 Beryllium (Be)  | 18                | 0                 | 0                  | .                     | .        | .                     | .        | 2.4529              | 0.0023   | 0.0006                | .                | .                     | .            | .               | NORMAL               |
| 6 Cadmium (Cd)    | 17                | 0                 | 0                  | .                     | .        | .                     | .        | 2.4863              | 0.0024   | 0.0002                | .                | .                     | .            | .               | NORMAL               |
| 7 Calcium (Ca)    | 20                | 18                | 90                 | .                     | .        | 38.8630               | .        | 2.3960              | 24.4479  | 6.0163                | .                | .                     | .            | .               | LOG                  |
| 8 Cesium (Cs)     | 20                | 0                 | 0                  | .                     | .        | .                     | .        | 2.3960              | 0.4925   | 0.2255                | .                | .                     | .            | .               | NORMAL               |
| 9 Chromium (Cr)   | 16                | 1                 | 6                  | .                     | .        | .                     | .        | 2.5237              | 0.0067   | 0.0035                | .                | .                     | .            | .               | NORMAL               |
| 10 Cobalt (Co)    | 20                | 0                 | 0                  | .                     | .        | .                     | .        | 2.3960              | 0.0228   | 0.0055                | .                | .                     | .            | .               | NORMAL               |
| 11 Copper (Cu)    | 19                | 2                 | 11                 | .                     | .        | .                     | .        | 2.4230              | 0.0166   | 0.0140                | .                | .                     | .            | .               | NORMAL               |
| 12 Iron (Fe)      | 19                | 3                 | 16                 | .                     | .        | .                     | .        | 2.4230              | 0.0489   | 0.0043                | .                | .                     | .            | .               | NORMAL               |
| 13 Lead (Pb)      | 20                | 2                 | 10                 | .                     | .        | .                     | .        | 2.3960              | 0.0055   | 0.0059                | .                | .                     | .            | .               | NORMAL               |
| 14 Lithium (Li)   | 20                | 5                 | 25                 | .                     | .        | .                     | .        | 2.3960              | 0.0624   | 0.0538                | .                | .                     | .            | .               | NORMAL               |
| 15 Magnesium (Mg) | 20                | 7                 | 35                 | .                     | .        | .                     | .        | 2.3960              | 4.2178   | 0.7074                | .                | .                     | .            | .               | LOG                  |
| 16 Manganese (Mn) | 19                | 6                 | 32                 | .                     | .        | .                     | .        | 2.4230              | 0.0167   | 0.0035                | .                | .                     | .            | .               | LOG                  |
| 17 Mercury (Hg)   | 19                | 5                 | 26                 | .                     | .        | .                     | .        | 2.4230              | 0.0001   | 0.0001                | .                | .                     | .            | .               | NORMAL               |
| 18 Molybdenum(Mo) | 20                | 2                 | 10                 | .                     | .        | .                     | .        | 2.3960              | 0.0859   | 0.0730                | .                | .                     | .            | .               | NORMAL               |
| 19 Nickel (Ni)    | 17                | 0                 | 0                  | .                     | .        | .                     | .        | 2.4863              | 0.0182   | 0.0039                | .                | .                     | .            | .               | NORMAL               |
| 20 Potassium (K)  | 19                | 9                 | 47                 | .                     | .        | .                     | .        | 2.4230              | 5.9247   | 6.0886                | .                | .                     | .            | .               | NORMAL               |
| 21 Selenium (Se)  | 19                | 6                 | 32                 | .                     | .        | .                     | .        | 2.4230              | 0.0062   | 0.0094                | .                | .                     | .            | .               | NORMAL               |
| 22 Silver (Ag)    | 19                | 0                 | 0                  | .                     | .        | .                     | .        | 2.4230              | 0.0066   | 0.0037                | .                | .                     | .            | .               | NORMAL               |
| 23 Sodium (Na)    | 20                | 20                | 100                | .                     | .        | 213.3108              | .        | 2.3960              | 155.9665 | 23.9334               | .                | .                     | .            | .               | LOG                  |
| 24 Strontium (Sr) | 20                | 8                 | 40                 | .                     | .        | .                     | .        | 2.3960              | 0.5658   | 0.2773                | .                | .                     | .            | .               | NORMAL               |
| 25 Thallium (Tl)  | 19                | 0                 | 0                  | .                     | .        | .                     | .        | 2.4230              | 0.0063   | 0.0050                | .                | .                     | .            | .               | NORMAL               |
| 26 Tin (Sn)       | 20                | 0                 | 0                  | .                     | .        | .                     | .        | 2.3960              | 0.1175   | 0.1649                | .                | .                     | .            | .               | NORMAL               |
| 27 Vanadium (V)   | 17                | 0                 | 0                  | .                     | .        | .                     | .        | 2.4863              | 0.0215   | 0.0079                | .                | .                     | .            | .               | NORMAL               |
| 28 Zinc (Zn)      | 17                | 10                | 59                 | .                     | .        | 0.2582                | .        | 2.4863              | 0.0440   | 0.0861                | .                | .                     | 3.49         | .               | NORMAL               |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values.

Tolerance Interval Calculations for Inorganic Concentrations in  
Background Unweathered Sandstone Ground Water Samples  
(Concentration units mg/l except pH)

| Analyte            | No. of<br>Samples | No. of<br>Detects | Percent<br>Detects | Lower                 |                       | Upper                 |                       | Standard<br>Deviation | Cohen<br>Revised |                       | Cohen<br>Tau | Cohen<br>Lambda | Data<br>Distrib-<br>ution |
|--------------------|-------------------|-------------------|--------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|------------------|-----------------------|--------------|-----------------|---------------------------|
|                    |                   |                   |                    | Tolerance<br>Interval | Tolerance<br>Interval | Tolerance<br>Interval | Tolerance<br>Interval |                       | Mean             | Standard<br>Deviation |              |                 |                           |
| 1 Bicarbonate      | 13                | 13                | 100                |                       |                       | 302.2308              | 2 6705                | 255 6284              | 17.4508          |                       |              |                 | LOG                       |
| 2 Carbonate        | 13                | 9                 | 69                 |                       |                       | 30.1793               | 2 6705                | 8 0692                | 6.7488           | 6 3774                | 8.9129       | 0 71            | NORMAL                    |
| 3 Cyanide          | 11                | 2                 | 18                 |                       |                       | .                     | 2 8150                | 0.0037                | 0.0017           | .                     | .            | .               | NORMAL                    |
| 4 Dissolved Solids | 13                | 13                | 100                |                       |                       | 728.1007              | 2 6705                | 496 7785              | 86.6212          | .                     | .            | .               | LOG                       |
| 5 Field pH         | 20                | 20                | 100                | 7 2917                |                       | 10.6483               | 2 3960                | 8 9700                | 0.7005           |                       |              |                 | NORMAL                    |
| 6 Nitrate/Nitrite  | 12                | 6                 | 50                 | .                     | .                     | .                     | 2 7363                | 0 3358                | 0.1948           | 0 7294                | 0.6543       | 0 49            | LOG                       |
| 7 Sulfate          | 13                | 8                 | 62                 | .                     | .                     | 290.9021              | 2 6705                | 49.5886               | 29.8358          | 88 9962               | 75 6059      | 0.55            | LOG                       |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values.

Tolerance Interval Calculations for Inorganic Concentrations in  
Background North Rocky Flats Unweathered Sandstone Ground Water Samples  
(Concentration units mg/l except pH)

| <u>Analyte</u> | <u>No. of<br/>Samples</u> | <u>No. of<br/>Detects</u> | <u>Percent<br/>Detects</u> | <u>Lower</u>    |                 | <u>Upper</u>    |                 | <u>Tolerance<br/>Factor</u> | <u>Tolerance<br/>Interval</u> | <u>Mean</u> | <u>Standard<br/>Deviation</u> | <u>Cohen<br/>Revised</u> |                  | <u>Cohen<br/>Tau</u> | <u>Cohen<br/>Lambda</u> | <u>Data<br/>Distrib-<br/>ution</u> |
|----------------|---------------------------|---------------------------|----------------------------|-----------------|-----------------|-----------------|-----------------|-----------------------------|-------------------------------|-------------|-------------------------------|--------------------------|------------------|----------------------|-------------------------|------------------------------------|
|                |                           |                           |                            | <u>Interval</u> | <u>Interval</u> | <u>Interval</u> | <u>Interval</u> |                             |                               |             |                               | <u>Mean</u>              | <u>Deviation</u> |                      |                         |                                    |
| 1 Chloride     | 6                         | 6                         | 100                        | .               | .               | .               | .               | 3 7077                      | 23 8698                       | 14.1990     | .                             | .                        | .                | .                    | .                       | LOG                                |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values.

Tolerance Interval Calculations for Inorganic Concentrations in  
Background South Rocky Flats Unweathered Sandstone Ground Water Samples  
(Concentration units mg/l except pH)

| <u>Analyte</u> | <u>No of<br/>Samples</u> | <u>No. of<br/>Detects</u> | <u>Percent<br/>Detects</u> | <u>Lower</u>                  |                 | <u>Upper</u>                  |                 | <u>Tolerance<br/>Factor</u> | <u>Mean</u> | <u>Standard<br/>Deviation</u> | <u>Cohen</u>            |   | <u>Cohen<br/>Tau</u> | <u>Cohen<br/>Lambda</u> | <u>Data<br/>Distrib-<br/>ution</u> |
|----------------|--------------------------|---------------------------|----------------------------|-------------------------------|-----------------|-------------------------------|-----------------|-----------------------------|-------------|-------------------------------|-------------------------|---|----------------------|-------------------------|------------------------------------|
|                |                          |                           |                            | <u>Tolerance<br/>Interval</u> | <u>Interval</u> | <u>Tolerance<br/>Interval</u> | <u>Interval</u> |                             |             |                               | <u>Revised<br/>Mean</u> | <u>Revised<br/>Standard<br/>Deviation</u> |                      |                         |                                    |
| 1 Chloride     | 7                        | 7                         | 100                        |                               |                 | 412.3540                      |                 | 3 3995                      | 159.6799    | 74 3275                       |                         |   | .                    | .                       | LOG                                |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values.

Tolerance Interval Calculations for Dissolved Radiochemical Concentrations in  
Background Unweathered Sandstone Ground Water Samples  
(Concentration units pCi/l)

| Analyte         | No. of<br>Samples | No. of<br>Detects | Percent<br>Detects | Lower                 |                       | Upper                 |                       | Standard<br>Deviation | Cohen<br>Revised<br>Mean | Cohen<br>Revised<br>Standard<br>Deviation | Cohen<br>Tau | Cohen<br>Lambda | Data<br>Distrib-<br>ution |
|-----------------|-------------------|-------------------|--------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|--------------------------|---|--------------|-----------------|---------------------------|
|                 |                   |                   |                    | Tolerance<br>Interval | Tolerance<br>Interval | Tolerance<br>Interval | Tolerance<br>Interval |                       |                          |   |              |                 |                           |
| 1 Americium-241 | 15                | 15                | 100                | .                     | .                     | 0 0636                | 2.5660                | 0 0091                | 0 0013                   | .   | .            | .               | NORMAL                    |
| 2 Cesium-137    | 20                | 20                | 100                | .                     | .                     | 0 8192                | 2.3960                | 0.1040                | 0 2985                   | .   | .            | .               | NORMAL                    |
| 3 Gross Alpha   | 19                | 19                | 100                | .                     | .                     | 28.4866               | 2.4230                | 5 4947                | 9.4889                   | .   | .            | .               | NORMAL                    |
| 4 Gross Beta    | 20                | 20                | 100                | .                     | .                     | 33 4236               | 2.3960                | 10.0800               | 9 7427                   | .   | .            | .               | NORMAL                    |
| 5 Plutonium-239 | 19                | 19                | 100                | .                     | .                     | 0.0109                | 2.4230                | 0.0023                | 0 0036                   | .   | .            | .               | NORMAL                    |
| 6 Radium-226    | 2                 | 2                 | 100                | .                     | .                     | .                     | 26.2597               | 0.4000                | 0.2828                   | .   | .            | .               | NORMAL                    |
| 7 Strontium-90  | 20                | 20                | 100                | .                     | .                     | 0.9283                | 2.3960                | 0 1650                | 0 3186                   | .   | .            | .               | NORMAL                    |
| 8 Tritium       | 20                | 20                | 100                | .                     | .                     | 495.8059              | 2.3960                | -25 0000              | 217.3646                 | .   | .            | .               | NORMAL                    |
| 9 Uranium-235   | 20                | 20                | 100                | .                     | .                     | 1.0681                | 2.3960                | 0.1580                | 0 3799                   | .   | .            | .               | NORMAL                    |
| 10 Uranium-238  | 20                | 20                | 100                | .                     | .                     | 7.0858                | 2.3960                | 1 0135                | 2.5343                   | .   | .            | .               | NORMAL                    |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values.

Tolerance Interval Calculations for Dissolved Metal Concentrations in  
Background Upper Most Flow System Ground Water Samples  
(Concentration units mg/l)

| Analyte            | No. of<br>Samples | No. of<br>Detects | Percent<br>Detects | Lower                 |                       | Upper                 |                       | Tolerance<br>Factor | Mean    | Standard<br>Deviation | Cohen           |                                  | Cohen<br>Lambda | Data<br>Distrib-<br>ution |
|--------------------|-------------------|-------------------|--------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|---------|-----------------------|-----------------|----------------------------------|-----------------|---------------------------|
|                    |                   |                   |                    | Tolerance<br>Interval | Tolerance<br>Interval | Tolerance<br>Interval | Tolerance<br>Interval |                     |         |                       | Revised<br>Mean | Revised<br>Standard<br>Deviation |                 |                           |
| 1 Aluminum (Al)    | 63                | 9                 | 14                 | .                     | .                     | 2.0116                | 0.0939                | 0.0374              | 0.0939  | 0.0721                | .               | .                                | .               | NORMAL                    |
| 2 Antimony (Sb)    | 75                | 0                 | 0                  | .                     | .                     | 1.9764                | 0.0560                | 0.0721              | 0.0560  | 0.0015                | .               | .                                | .               | NORMAL                    |
| 3 Arsenic (As)     | 64                | 2                 | 3                  | .                     | .                     | 2.0082                | 0.0043                | 0.0015              | 0.0043  | 0.0185                | .               | .                                | .               | NORMAL                    |
| 4 Barium (Ba)      | 77                | 12                | 16                 | .                     | .                     | 1.9715                | 0.0984                | 0.0006              | 0.0984  | 0.0011                | .               | .                                | .               | NORMAL                    |
| 5 Beryllium (Be)   | 68                | 0                 | 0                  | .                     | .                     | 1.9957                | 0.0023                | 0.0006              | 0.0023  | 0.0011                | .               | .                                | .               | NORMAL                    |
| 6 Cadmium (Cd)     | 72                | 3                 | 4                  | .                     | .                     | 1.9843                | 0.0027                | 0.0011              | 0.0027  | 3.7224                | .               | .                                | .               | NORMAL                    |
| 7 Calcium (Ca)     | 77                | 77                | 100                | .                     | 62.5908               | 1.9715                | 55.2521               | 0.2740              | 55.2521 | 0.0017                | .               | .                                | .               | LOG                       |
| 8 Cesium (Cs)      | 69                | 0                 | 0                  | .                     | .                     | 1.9927                | 0.5363                | 0.0017              | 0.5363  | 0.0051                | .               | .                                | .               | NORMAL                    |
| 9 Chromium (Cr)    | 72                | 1                 | 1                  | .                     | .                     | 1.9843                | 0.0057                | 0.0051              | 0.0057  | 0.0067                | .               | .                                | .               | NORMAL                    |
| 10 Cobalt (Co)     | 76                | 0                 | 0                  | .                     | .                     | 1.9739                | 0.0229                | 0.0067              | 0.0229  | 0.1568                | .               | .                                | .               | NORMAL                    |
| 11 Copper (Cu)     | 64                | 4                 | 6                  | .                     | .                     | 2.0082                | 0.0134                | 0.0047              | 0.0134  | 0.0621                | .               | .                                | .               | NORMAL                    |
| 12 Iron (Fe)       | 70                | 15                | 21                 | .                     | .                     | 1.9899                | 0.0927                | 0.0001              | 0.0927  | 0.0708                | .               | .                                | .               | NORMAL                    |
| 13 Lead (Pb)       | 72                | 8                 | 11                 | .                     | .                     | 1.9843                | 0.0032                | 0.0001              | 0.0032  | 0.0048                | .               | .                                | .               | NORMAL                    |
| 14 Lithium (Li)    | 73                | 26                | 36                 | .                     | .                     | 1.9816                | 0.0551                | 0.0001              | 0.0551  | 0.0366                | .               | .                                | .               | NORMAL                    |
| 15 Magnesium (Mg)  | 77                | 58                | 75                 | .                     | 16.0851               | 1.9715                | 11.0557               | 1.3281              | 11.0557 | 0.0184                | 11.9183         | 2.1135                           | 0.36            | LOG                       |
| 16 Manganese (Mn)  | 76                | 51                | 67                 | .                     | 0.2133                | 1.9739                | 0.0751                | 0.0184              | 0.0751  | 0.0001                | 0.1124          | 0.0511                           | 0.44            | LOG                       |
| 17 Mercury (Hg)    | 66                | 7                 | 11                 | .                     | .                     | 2.0018                | 0.0001                | 0.0001              | 0.0001  | 0.0048                | .               | .                                | .               | NORMAL                    |
| 18 Molybdenum (Mo) | 77                | 4                 | 5                  | .                     | .                     | 1.9715                | 0.0630                | 0.0708              | 0.0630  | 1.5044                | .               | .                                | .               | NORMAL                    |
| 19 Nickel (Ni)     | 65                | 2                 | 3                  | .                     | .                     | 2.0050                | 0.0189                | 0.0048              | 0.0189  | 0.0366                | .               | .                                | .               | NORMAL                    |
| 20 Potassium (K)   | 67                | 13                | 19                 | .                     | .                     | 1.9987                | 2.5977                | 0.0034              | 2.5977  | 0.0072                | .               | .                                | .               | NORMAL                    |
| 21 Selenium (Se)   | 62                | 10                | 16                 | .                     | .                     | 2.0150                | 0.0117                | 0.0072              | 0.0117  | 0.1547                | .               | .                                | .               | NORMAL                    |
| 22 Silver (Ag)     | 70                | 0                 | 0                  | .                     | .                     | 1.9899                | 0.0062                | 0.0066              | 0.0062  | 0.0256                | .               | .                                | .               | NORMAL                    |
| 23 Sodium (Na)     | 77                | 75                | 97                 | .                     | 46.7359               | 1.9715                | 35.6423               | 5.6270              | 35.6423 | 0.0072                | .               | .                                | .               | LOG                       |
| 24 Strontium (Sr)  | 77                | 24                | 31                 | .                     | .                     | 1.9715                | 0.5461                | 0.7973              | 0.5461  | 0.0072                | .               | .                                | .               | NORMAL                    |
| 25 Thallium (Tl)   | 73                | 1                 | 1                  | .                     | .                     | 1.9816                | 0.0084                | 0.0072              | 0.0084  | 0.1547                | .               | .                                | .               | NORMAL                    |
| 26 Tin (Sn)        | 75                | 0                 | 0                  | .                     | .                     | 1.9764                | 0.1127                | 0.0066              | 0.1127  | 0.0066                | .               | .                                | .               | NORMAL                    |
| 27 Vanadium (V)    | 76                | 0                 | 0                  | .                     | .                     | 1.9739                | 0.0224                | 0.0066              | 0.0224  | 0.0256                | .               | .                                | .               | NORMAL                    |
| 28 Zinc (Zn)       | 67                | 31                | 46                 | .                     | .                     | 1.9987                | 0.0250                | 0.0256              | 0.0250  | 0.0256                | .               | .                                | .               | NORMAL                    |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values.

Tolerance Interval Calculations for Dissolved Metal Concentrations in  
Background Lower Most Flow System Ground Water Samples  
(Concentration units mg/l)

| Analyte            | No. of<br>Samples | No. of<br>Detects | Percent<br>Detects | Lower                 |                       | Upper                 |                       | Tolerance<br>Factor | Mean     | Standard<br>Deviation | Cohen           |                                  | Cohen<br>Tau | Cohen<br>Lambda | Data<br>Distribution |
|--------------------|-------------------|-------------------|--------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|----------|-----------------------|-----------------|----------------------------------|--------------|-----------------|----------------------|
|                    |                   |                   |                    | Tolerance<br>Interval | Tolerance<br>Interval | Tolerance<br>Interval | Tolerance<br>Interval |                     |          |                       | Revised<br>Mean | Revised<br>Standard<br>Deviation |              |                 |                      |
| 1 Aluminum (Al)    | 17                | 1                 | 6                  | .                     | .                     | .                     | .                     | 2.4863              | 0.1084   | 0.0600                | .               | .                                | .            | .               | NORMAL               |
| 2 Antimony (Sb)    | 22                | 1                 | 5                  | .                     | .                     | .                     | .                     | 2.3490              | 0.0666   | 0.0808                | .               | .                                | .            | .               | NORMAL               |
| 3 Arsenic (As)     | 23                | 3                 | 13                 | .                     | .                     | .                     | .                     | 2.3283              | 0.0055   | 0.0033                | .               | .                                | .            | .               | NORMAL               |
| 4 Barium (Ba)      | 23                | 2                 | 9                  | .                     | .                     | .                     | .                     | 2.3283              | 0.0954   | 0.0160                | .               | .                                | .            | .               | NORMAL               |
| 5 Beryllium (Be)   | 21                | 0                 | 0                  | .                     | .                     | .                     | .                     | 2.3714              | 0.0023   | 0.0005                | .               | .                                | .            | .               | NORMAL               |
| 6 Cadmium (Cd)     | 20                | 0                 | 0                  | .                     | .                     | .                     | .                     | 2.3960              | 0.0024   | 0.0002                | .               | .                                | .            | .               | NORMAL               |
| 7 Calcium (Ca)     | 24                | 22                | 92                 | .                     | .                     | .                     | 49.2824               | 2.3093              | 31.4982  | 7.7011                | .               | .                                | .            | .               | LOG                  |
| 8 Cesium (Cs)      | 24                | 0                 | 0                  | .                     | .                     | .                     | .                     | 2.3093              | 0.4937   | 0.2050                | .               | .                                | .            | .               | NORMAL               |
| 9 Chromium (Cr)    | 19                | 2                 | 11                 | .                     | .                     | .                     | .                     | 2.4230              | 0.0068   | 0.0035                | .               | .                                | .            | .               | NORMAL               |
| 10 Cobalt (Co)     | 23                | 0                 | 0                  | .                     | .                     | .                     | .                     | 2.3283              | 0.0230   | 0.0052                | .               | .                                | .            | .               | NORMAL               |
| 11 Copper (Cu)     | 22                | 2                 | 9                  | .                     | .                     | .                     | .                     | 2.3490              | 0.0161   | 0.0130                | .               | .                                | .            | .               | NORMAL               |
| 12 Iron (Fe)       | 23                | 3                 | 13                 | .                     | .                     | .                     | .                     | 2.3283              | 0.0491   | 0.0039                | .               | .                                | .            | .               | NORMAL               |
| 13 Lead (Pb)       | 24                | 2                 | 8                  | .                     | .                     | .                     | .                     | 2.3093              | 0.0050   | 0.0055                | .               | .                                | .            | .               | NORMAL               |
| 14 Lithium (Li)    | 24                | 7                 | 29                 | .                     | .                     | .                     | .                     | 2.3093              | 0.1422   | 0.3571                | .               | .                                | .            | .               | NORMAL               |
| 15 Magnesium (Mg)  | 24                | 11                | 46                 | .                     | .                     | .                     | .                     | 2.3093              | 5.5813   | 1.0610                | .               | .                                | .            | .               | LOG                  |
| 16 Manganese (Mn)  | 23                | 9                 | 39                 | .                     | .                     | .                     | .                     | 2.3283              | 0.0281   | 0.0082                | .               | .                                | .            | .               | LOG                  |
| 17 Mercury (Hg)    | 23                | 5                 | 22                 | .                     | .                     | .                     | .                     | 2.3283              | 0.0001   | 0.0001                | .               | .                                | .            | .               | NORMAL               |
| 18 Molybdenum (Mo) | 24                | 2                 | 8                  | .                     | .                     | .                     | .                     | 2.3093              | 0.0799   | 0.0677                | .               | .                                | .            | .               | NORMAL               |
| 19 Nickel (Ni)     | 20                | 0                 | 0                  | .                     | .                     | .                     | .                     | 2.3960              | 0.0185   | 0.0037                | .               | .                                | .            | .               | NORMAL               |
| 20 Potassium (K)   | 23                | 11                | 48                 | .                     | .                     | .                     | .                     | 2.3283              | 5.7861   | 5.6767                | .               | .                                | .            | .               | NORMAL               |
| 21 Selenium (Se)   | 23                | 6                 | 26                 | .                     | .                     | .                     | .                     | 2.3283              | 0.0055   | 0.0086                | .               | .                                | .            | .               | NORMAL               |
| 22 Silver (Ag)     | 23                | 0                 | 0                  | .                     | .                     | .                     | .                     | 2.3283              | 0.0063   | 0.0034                | .               | .                                | .            | .               | NORMAL               |
| 23 Sodium (Na)     | 24                | 24                | 100                | .                     | .                     | .                     | 231.8338              | 2.3093              | 154.0768 | 33.6713               | .               | .                                | .            | .               | LOG                  |
| 24 Strontium (Sr)  | 24                | 10                | 42                 | .                     | .                     | .                     | .                     | 2.3093              | 0.6460   | 0.4071                | .               | .                                | .            | .               | NORMAL               |
| 25 Thallium (Tl)   | 23                | 0                 | 0                  | .                     | .                     | .                     | .                     | 2.3283              | 0.0061   | 0.0045                | .               | .                                | .            | .               | NORMAL               |
| 26 Tin (Sn)        | 24                | 0                 | 0                  | .                     | .                     | .                     | .                     | 2.3093              | 0.1062   | 0.1520                | .               | .                                | .            | .               | NORMAL               |
| 27 Vanadium (V)    | 21                | 0                 | 0                  | .                     | .                     | .                     | .                     | 2.3714              | 0.0221   | 0.0072                | .               | .                                | .            | .               | NORMAL               |
| 28 Zinc (Zn)       | 21                | 11                | 52                 | .                     | .                     | .                     | 0.2234                | 2.3714              | 0.0383   | 0.0781                | .               | .                                | 3.65         | .               | NORMAL               |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values.

Tolerance Interval Calculations for Inorganic Concentrations in  
Background Upper Most Flow System Ground Water Samples  
(Concentration units mg/l except pH)

| Analyte            | No. of<br>Samples | No. of<br>Detects | Percent<br>Detects | Lower                 |                       | Upper                 |          | Tolerance<br>Factor | Standard<br>Deviation | Cohen<br>Revised |                       | Cohen<br>Lambda | Data<br>Distrib-<br>ution |
|--------------------|-------------------|-------------------|--------------------|-----------------------|-----------------------|-----------------------|----------|---------------------|-----------------------|------------------|-----------------------|-----------------|---------------------------|
|                    |                   |                   |                    | Tolerance<br>Interval | Tolerance<br>Interval | Tolerance<br>Interval | Mean     |                     |                       | Mean             | Standard<br>Deviation |                 |                           |
| 1 Bicarbonate      | 82                | 82                | 100                | .                     | 249.3524              | 1 9600                | 218.0855 | 15 9527             |                       |                  |                       |                 | LOG                       |
| 2 Carbonate        | 81                | 0                 | 0                  |                       | .                     | 1 9622                | 2 5000   | 0.0000              |                       |                  |                       |                 | NORMAL                    |
| 3 Cyanide          | 67                | 3                 | 4                  | .                     | .                     | 1 9987                | 0 0030   | 0.0018              |                       |                  |                       |                 | NORMAL                    |
| 4 Dissolved Solids | 81                | 81                | 100                |                       | 388 7575              | 1.9622                | 339 7570 | 24.9827             |                       |                  |                       |                 | LOG                       |
| 5 Field pH         | 92                | 92                | 100                | 6 3897                | 8 2190                | 1.9401                | 7 3043   | 0.4715              |                       |                  |                       |                 | NORMAL                    |
| 6 Nitrate/Nitrite  | 79                | 66                | 84                 | .                     | 3 4338                | 1 9667                | 1 3732   | 0 5029              | 1 7810                | 0 8404           | 0 12                  | 0 18            | LOG                       |
| 7 Sulfate          | 82                | 82                | 100                | .                     | 67 0794               | 1.9600                | 54 2917  | 6 5244              |                       |                  |                       |                 | LOG                       |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values.

Tolerance Interval Calculations for Inorganic Concentrations in  
Background Lower Most Flow System Ground Water Samples  
(Concentration units mg/l except pH)

| Analyte            | No. of<br>Samples | No. of<br>Detects | Percent<br>Detects | Lower                 |                       | Upper                 |                       | Tolerance<br>Factor | Mean     | Standard<br>Deviation | Cohen<br>Revised<br>Mean | Cohen<br>Revised<br>Standard<br>Deviation | Cohen<br>Tau | Cohen<br>Lambda | Data<br>Distrib-<br>ution |
|--------------------|-------------------|-------------------|--------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|----------|-----------------------|--------------------------|---|--------------|-----------------|---------------------------|
|                    |                   |                   |                    | Tolerance<br>Interval | Tolerance<br>Interval | Tolerance<br>Interval | Tolerance<br>Interval |                     |          |                       |                          |   |              |                 |                           |
| 1 Bicarbonate      | 17                | 17                | 100                |                       |                       | 274.7981              | 2.4863                | 2.4863              | 228.0014 | 18.8221               |                          |   |              |                 | LOG                       |
| 2 Carbonate        | 17                | 9                 | 53                 |                       |                       | 28.6813               | 2.4863                | 2.4863              | 6.7588   | 6.3316                | 3.4396                   | 10.1525                                   | 0.71         | 0.88            | NORMAL                    |
| 3 Cyanide          | 15                | 2                 | 13                 |                       |                       |                       | 2.5660                | 2.5660              | 0.0035   | 0.0018                |                          |   |              |                 | NORMAL                    |
| 4 Dissolved Solids | 17                | 17                | 100                |                       |                       | 592.6891              | 2.4863                | 2.4863              | 422.6766 | 68.3807               |                          |   |              |                 | LOG                       |
| 5 Field pH         | 25                | 25                | 100                | 6.2443                |                       | 10.9077               | 2.2917                | 2.2917              | 8.5760   | 1.0175                |                          |   |              |                 | NORMAL                    |
| 6 Nitrate/Nitrite  | 17                | 10                | 59                 |                       |                       | 6.4068                | 2.4863                | 2.4863              | 0.8197   | 0.4995                | 2.0070                   | 1.7696                                    | 0.24         | 0.66            | LOG                       |
| 7 Sulfate          | 17                | 12                | 71                 |                       |                       | 153.7200              | 2.4863                | 2.4863              | 39.4705  | 19.1925               | 57.0920                  | 38.8647                                   | 0.44         | 0.48            | LOG                       |

NORMAL=Normal data distribution assumed    LOG=Log normal data distribution assumed    = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values

Tolerance Interval Calculations for Inorganic Concentrations in  
Background North Rocky Flats Upper Most Flow System Ground Water Samples  
(Concentration units mg/l except pH)

| Analyte    | No of Samples | No. of Detects | Percent Detects | Lower              |          | Upper              |          | Tolerance Factor | Mean   | Standard Deviation | Cohen Revised |           | Cohen Tau | Cohen Lambda | Data Distribution |
|------------|---------------|----------------|-----------------|--------------------|----------|--------------------|----------|------------------|--------|--------------------|---------------|-----------|-----------|--------------|-------------------|
|            |               |                |                 | Tolerance Interval | Interval | Tolerance Interval | Interval |                  |        |                    | Mean          | Deviation |           |              |                   |
| 1 Chloride | 39            | 33             | 85              | .                  | .        | 10 6716            | 2 1330   | 7 6584           | 1 0528 | 7.9398             | 1 2807        | 0 12      | 0 18      | LOG          |                   |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values.

Tolerance Interval Calculations for Inorganic Concentrations in  
Background North Rocky Flats Lower Most Flow System Ground Water Samples  
(Concentration units mg/l except pH)

| <u>Analyte</u> | <u>No of<br/>Samples</u> | <u>No of<br/>Detects</u> | <u>Percent<br/>Detects</u> | <u>Lower Tolerance Interval</u> |   | <u>Upper Tolerance Interval</u> |   | <u>Tolerance<br/>Factor</u> | <u>Mean</u> | <u>Standard<br/>Deviation</u> | <u>Cohen Revised Mean</u> |   | <u>Cohen Revised Standard Deviation</u> |   | <u>Cohen<br/>Tau</u> | <u>Cohen<br/>Lambda</u> | <u>Data<br/>Distribution</u> |
|----------------|--------------------------|--------------------------|----------------------------|---------------------------------|---|---------------------------------|---|-----------------------------|-------------|-------------------------------|---------------------------|---|---|---|----------------------|-------------------------|------------------------------|
|                |                          |                          |                            |                                 |   |                                 |   |                             |             |                               |                           |   |   |   |                      |                         |                              |
| 1 Chloride     | 6                        | 6                        | 100                        | .                               | . | .                               | . | 3 7077                      | 23 8698     | 14 1990                       | .                         | . | .                                       | . | .                    | .                       | LOG                          |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values.

Tolerance Interval Calculations for Inorganic Concentrations in  
Background South Rocky Flats Upper Most Flow System Ground Water Samples  
(Concentration units mg/l except pH)

| <u>Analyte</u> | <u>No. of<br/>Samples</u> | <u>No. of<br/>Detects</u> | <u>Percent<br/>Detects</u> | <u>Lower</u>                  |                 | <u>Upper</u>                  |                 | <u>Tolerance<br/>Factor</u> | <u>Mean</u> | <u>Standard<br/>Deviation</u> | <u>Cohen<br/>Revised</u> |                  | <u>Cohen<br/>Tau</u> | <u>Cohen<br/>Lambda</u> | <u>Data<br/>Distrib-<br/>ution</u> |
|----------------|---------------------------|---------------------------|----------------------------|-------------------------------|-----------------|-------------------------------|-----------------|-----------------------------|-------------|-------------------------------|--------------------------|------------------|----------------------|-------------------------|------------------------------------|
|                |                           |                           |                            | <u>Tolerance<br/>Interval</u> | <u>Interval</u> | <u>Tolerance<br/>Interval</u> | <u>Interval</u> |                             |             |                               | <u>Mean</u>              | <u>Deviation</u> |                      |                         |                                    |
| 1 Chloride     | 43                        | 38                        | 88                         | .                             | .               | 21 9777                       | 2 1048          | 15 8927                     | 2 8910      |                               |                          |                  |                      |                         | LOG                                |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values

Tolerance Interval Calculations for Inorganic Concentrations in  
Background South Rocky Flats Lower Most Flow System Ground Water Samples  
(Concentration units mg/l except pH)

| <u>Analyte</u> | <u>No of<br/>Samples</u> | <u>No. of<br/>Detects</u> | <u>Percent<br/>Detects</u> | <u>Lower</u>                  |                 | <u>Upper</u>                  |                 | <u>Tolerance<br/>Factor</u> | <u>Mean</u> | <u>Standard<br/>Deviation</u> | <u>Cohen<br/>Revised</u> |                               | <u>Cohen<br/>Tau</u> | <u>Cohen<br/>Lambda</u> | <u>Data<br/>Distrib-<br/>ution</u> |
|----------------|--------------------------|---------------------------|----------------------------|-------------------------------|-----------------|-------------------------------|-----------------|-----------------------------|-------------|-------------------------------|--------------------------|-------------------------------|----------------------|-------------------------|------------------------------------|
|                |                          |                           |                            | <u>Tolerance<br/>Interval</u> | <u>Interval</u> | <u>Tolerance<br/>Interval</u> | <u>Interval</u> |                             |             |                               | <u>Mean</u>              | <u>Standard<br/>Deviation</u> |                      |                         |                                    |
| 1 Chloride     | 11                       | 11                        | 100                        |                               |                 | 259                           | 1303            | 2                           | 8150        | 102                           | 2999                     | 55                            | 7125                 | .                       | LOG                                |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values.

Tolerance Interval Calculations for Dissolved Radiochemical Concentrations in  
Background Upper Most Flow System Ground Water Samples  
(Concentration units pCi/l)

| Analyte            | No. of<br>Samples | No. of<br>Detects | Percent<br>Detects | Lower                 |          | Upper                 |          | Tolerance<br>Factor | Mean   |      | Standard<br>Deviation | Cohen<br>Revised      |                       | Cohen<br>Tau | Cohen<br>Lambda | Data<br>Distrib-<br>ution |
|--------------------|-------------------|-------------------|--------------------|-----------------------|----------|-----------------------|----------|---------------------|--------|------|-----------------------|-----------------------|-----------------------|--------------|-----------------|---------------------------|
|                    |                   |                   |                    | Tolerance<br>Interval | Interval | Tolerance<br>Interval | Interval |                     | Mean   | Mean |                       | Standard<br>Deviation | Standard<br>Deviation |              |                 |                           |
| 1 Americium-241    | 59                | 59                | 100                | .                     | 0 0167   | 2 0259                | 0 0013   | 0 0076              | .      | .    | .                     | 0 0076                | .                     | .            | .               | NORMAL                    |
| 2 Cesium-137       | 73                | 73                | 100                | .                     | 0 5061   | 1 9816                | 0 0527   | 0 2288              | .      | .    | .                     | 0 2288                | .                     | .            | .               | NORMAL                    |
| 3 Gross Alpha      | 73                | 73                | 100                | .                     | 55.0708  | 1 9816                | 7 7260   | 23 8918             | .      | .    | .                     | 23 8918               | .                     | .            | .               | NORMAL                    |
| 4 Gross Beta       | 73                | 73                | 100                | .                     | 59 6331  | 1 9816                | 8.1507   | 25 9798             | .      | .    | .                     | 25 9798               | .                     | .            | .               | NORMAL                    |
| 5 Plutonium-239    | 67                | 67                | 100                | .                     | 0.0150   | 1 9987                | 0 0027   | 0.0061              | .      | .    | .                     | 0.0061                | .                     | .            | .               | NORMAL                    |
| 6 Radium-226       | 21                | 21                | 100                | .                     | 96 2939  | 2 3714                | 8.5674   | 36.9932             | .      | .    | .                     | 36.9932               | .                     | .            | .               | NORMAL                    |
| 7 Strontium-90     | 73                | 73                | 100                | .                     | 0.9004   | 1 9816                | 0.1390   | 0 3842              | .      | .    | .                     | 0 3842                | .                     | .            | .               | NORMAL                    |
| 8 Tritium          | 77                | 77                | 100                | .                     | 359.0676 | 1 9715                | 73.3247  | 144.9376            | .      | .    | .                     | 144.9376              | .                     | .            | .               | NORMAL                    |
| 9 Uranium-233,-234 | 1                 | 1                 | 100                | .                     | .        | .                     | 0 1000   | .                   | 0 1000 | .    | .                     | .                     | .                     | .            | .               | NORMAL                    |
| 10 Uranium-235     | 75                | 75                | 100                | .                     | 2 0862   | 1 9764                | 0 2184   | 0 9450              | .      | .    | .                     | 0 9450                | .                     | .            | .               | NORMAL                    |
| 11 Uranium-238     | 75                | 75                | 100                | .                     | 25 5702  | 1 9764                | 3 1653   | 11.3359             | .      | .    | .                     | 11.3359               | .                     | .            | .               | NORMAL                    |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values

Tolerance Interval Calculations for Dissolved Radiochemical Concentrations in  
Background Lower Most Flow System Ground Water Samples  
(Concentration units pCi/l)

| Analyte         | No. of<br>Samples | No. of<br>Detects | Percent<br>Detects | Lower                 |                       | Upper                 |                       | Tolerance<br>Factor | Mean     | Standard<br>Deviation | Cohen<br>Revised<br>Mean | Cohen<br>Revised<br>Standard<br>Deviation | Cohen<br>Tau | Cohen<br>Lambda | Data<br>Distrib-<br>ution |
|-----------------|-------------------|-------------------|--------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|----------|-----------------------|--------------------------|---|--------------|-----------------|---------------------------|
|                 |                   |                   |                    | Tolerance<br>Interval | Tolerance<br>Interval | Tolerance<br>Interval | Tolerance<br>Interval |                     |          |                       |                          |   |              |                 |                           |
| 1 Americium-241 | 18                | 18                | 100                | .                     | .                     | 0 0556                | 2 4529                | 0 0076              | 0 0196   | .                     | .                        | .   | .            | .               | NORMAL                    |
| 2 Cesium-137    | 24                | 24                | 100                | .                     | .                     | 0 7837                | 2 3093                | 0 0854              | 0 3024   | .                     | .                        | .   | .            | .               | NORMAL                    |
| 3 Gross Alpha   | 23                | 23                | 100                | .                     | .                     | 25 3930               | 2 3283                | 5 0913              | 8 7195   | .                     | .                        | .   | .            | .               | NORMAL                    |
| 4 Gross Beta    | 24                | 24                | 100                | .                     | .                     | 30 4997               | 2 3093                | 8 6042              | 9 4815   | .                     | .                        | .   | .            | .               | NORMAL                    |
| 5 Plutonium-239 | 23                | 23                | 100                | .                     | .                     | 0 0113                | 2 3283                | 0 0026              | 0 0038   | .                     | .                        | .   | .            | .               | NORMAL                    |
| 6 Radium-226    | 3                 | 3                 | 100                | .                     | .                     | .                     | 7 6559                | 0 4000              | 0 2000   | .                     | .                        | .   | .            | .               | NORMAL                    |
| 7 Strontium-90  | 24                | 24                | 100                | .                     | .                     | 0 8554                | 2 3093                | 0 1508              | 0 3051   | .                     | .                        | .   | .            | .               | NORMAL                    |
| 8 Tritium       | 26                | 26                | 100                | .                     | .                     | 420 4114              | 2 2753                | -17 6923            | 192 5473 | .                     | .                        | .   | .            | .               | NORMAL                    |
| 9 Uranium-235   | 24                | 24                | 100                | .                     | .                     | 0 9438                | 2 3093                | 0 1371              | 0 3493   | .                     | .                        | .   | .            | .               | NORMAL                    |
| 10 Uranium-238  | 24                | 24                | 100                | .                     | .                     | 6 2485                | 2 3093                | 0 8792              | 2 3251   | .                     | .                        | .   | .            | .               | NORMAL                    |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values.

Tolerance Interval Calculations for Total Metal Concentrations in  
Background Rocky Flats Alluvial Borehole Samples  
(Concentration units mg/kg)

| Analyte           | No. of<br>Samples | No. of<br>Detects | Percent<br>Detects | Lower<br>Tolerance<br>Interval | Upper<br>Tolerance<br>Interval | Tolerance<br>Factor | Mean       | Standard<br>Deviation | Cohen<br>Revised<br>Mean | Cohen<br>Revised<br>Standard<br>Deviation | Cohen<br>Tau | Cohen<br>Lambda | Data<br>Distrib-<br>ution |
|-------------------|-------------------|-------------------|--------------------|--------------------------------|--------------------------------|---------------------|------------|-----------------------|--------------------------|---|--------------|-----------------|---------------------------|
| 1 Aluminum (Al)   | 77                | 75                | 97                 | .                              | 13419.4947                     | 1.9715              | 11908.5758 | 766.3845              |                          |   |              |                 | LOG                       |
| 2 Antimony (Sb)   | 56                | 0                 | 0                  | .                              | .                              | 2.0377              | 13.3144    | 0.4587                |                          |   |              |                 | LOG                       |
| 3 Arsenic (As)    | 77                | 51                | 66                 |                                | 4.2988                         | 1.9715              | 3.8899     | 0.2588                | 3.6273                   | 0.3406                                    | 0.86         | 0.65            | LOG                       |
| 4 Barium (Ba)     | 77                | 59                | 77                 | .                              | 79.4928                        | 1.9715              | 73.3391    | 3.7966                | 70.3734                  | 4.6256                                    | 0.60         | 0.40            | LOG                       |
| 5 Beryllium (Be)  | 77                | 66                | 86                 | .                              | 4.7040                         | 1.9715              | 3.9766     | 0.3690                |                          | .   |              |                 | LOG                       |
| 6 Cadmium (Cd)    | 54                | 7                 | 13                 |                                | .                              | 2.0463              | 1.2147     | 0.0553                |                          |   |              | .               | LOG                       |
| 7 Cesium (Cs)     | 77                | 0                 | 0                  |                                |                                | 1.9715              | 227.5016   | 3.0252                |                          |   |              | .               | LOG                       |
| 8 Cobalt (Co)     | 77                | 17                | 22                 |                                | .                              | 1.9715              | 12.0462    | 0.3172                |                          |   |              |                 | LOG                       |
| 9 Iron (Fe)       | 77                | 77                | 100                | .                              | 13753.5715                     | 1.9715              | 12625.8128 | 572.0338              |                          |   |              |                 | LOG                       |
| 10 Magnesium (Mg) | 77                | 71                | 92                 |                                | 2484.2373                      | 1.9715              | 2268.1101  | 109.6264              |                          |   |              |                 | LOG                       |
| 11 Manganese (Mn) | 77                | 77                | 100                |                                | 234.9950                       | 1.9715              | 193.2978   | 21.1501               |                          |   |              |                 | LOG                       |
| 12 Potassium (K)  | 76                | 40                | 53                 |                                | 1557.9829                      | 1.9739              | 1494.7295  | 61.8965               | 1371.6389                | 94.4020                                   | 0.53         | 0.85            | LOG                       |
| 13 Selenium (Se)  | 53                | 0                 | 0                  |                                | .                              | 2.0507              | 2.6324     | 0.3535                |                          |   |              |                 | LOG                       |
| 14 Silver (Ag)    | 71                | 23                | 32                 |                                | .                              | 1.9871              | 5.0794     | 0.6858                |                          |   |              |                 | LOG                       |
| 15 Sodium (Na)    | 77                | 1                 | 1                  | .                              | .                              | 1.9715              | 1132.9907  | 29.5303               |                          |   |              |                 | LOG                       |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values.

Tolerance Interval Calculations for Total Metal Concentrations in  
Background North Rocky Flats Rocky Flats Alluvial Borehole Samples  
(Concentration Units mg/kg)

| Analyte          | No of<br>Samples | No. of<br>Defects | Percent<br>Defects | Lower<br>Tolerance<br>Interval | Upper<br>Tolerance<br>Interval | Tolerance<br>Factor | Mean      | Standard<br>Deviation | Cohen<br>Revised<br>Mean | Cohen<br>Revised<br>Standard<br>Deviation | Cohen<br>Tau | Cohen<br>Lambda | Data<br>Distrib-<br>ution |
|------------------|------------------|-------------------|--------------------|--------------------------------|--------------------------------|---------------------|-----------|-----------------------|--------------------------|---|--------------|-----------------|---------------------------|
| 1 Calcium (Ca)   | 36               | 35                | 97                 | .                              | 8430 1986                      | 2 1577              | 6005.5435 | 1123.7350             | .                        | .   | .            | .               | LOG                       |
| 2 Chromium (Cr)  | 36               | 36                | 100                | .                              | 19.9897                        | 2 1577              | 15 8774   | 1.9059                | .                        | .   | .            | .               | LOG                       |
| 3 Copper (Cu)    | 36               | 33                | 92                 |                                | 11.1314                        | 2.1577              | 10 0000   | 0 5244                |                          |   |              |                 | LOG                       |
| 4 Lead (Pb)      | 36               | 36                | 100                | .                              | 12 1546                        | 2.1577              | 9 4064    | 1.2737                |                          |   | .            | .               | LOG                       |
| 5 Lithium (Li)   | 36               | 2                 | 6                  | .                              | .                              | 2 1577              | 22 7441   | 0.3730                | .                        | .   | .            | .               | LOG                       |
| 6 Mercury (Hg)   | 35               | 8                 | 23                 | .                              | .                              | 2.1667              | 0 1394    | 0.0073                |                          |   |              |                 | LOG                       |
| 7 Molybdenum(Mo) | 36               | 9                 | 25                 | .                              | .                              | 2.1577              | 23 7203   | 0.5731                | .                        | .   |              |                 | LOG                       |
| 8 Nickel (Ni)    | 33               | 26                | 79                 | .                              | 21.4229                        | 2.1863              | 17 5524   | 1 5800                | 17.3420                  | 1.8666                                    | 0 45         | 0 30            | LOG                       |
| 9 Strontium (Sr) | 36               | 11                | 31                 | .                              | .                              | 2 1577              | 29 5841   | 2 2803                |                          |   | .            | .               | LOG                       |
| 10 Thallium (Tl) | 20               | 0                 | 0                  |                                |                                | 2.3960              | 2 2752    | 0 0507                |                          |   |              |                 | LOG                       |
| 11 Tin (Sn)      | 33               | 12                | 36                 |                                |                                | 2.1863              | 32 2089   | 2 9266                |                          |   | .            | .               | LOG                       |
| 12 Vanadium (V)  | 36               | 33                | 92                 | .                              | 37.1857                        | 2 1577              | 30 4651   | 3.1147                |                          |   | .            | .               | LOG                       |
| 13 Zinc (Zn)     | 36               | 36                | 100                |                                | 39 7143                        | 2.1577              | 28 6620   | 5 1224                | .                        | .   | .            | .               | LOG                       |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values.

Tolerance Interval Calculations for Total Metal Concentrations in  
Background South Rocky Flats Rocky Flats Alluvial Borehole Samples  
(Concentration units mg/kg)

| Analyte           | No of<br>Samples | No. of<br>Detects | Percent<br>Detects | Lower                 |                       | Upper                 |                       | Tolerance<br>Factor | Mean     | Standard<br>Deviation | Cohen<br>Revised<br>Mean | Cohen<br>Revised<br>Standard<br>Deviation | Cohen<br>Tau | Cohen<br>Lambda | Data<br>Distrib-<br>ution |
|-------------------|------------------|-------------------|--------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|----------|-----------------------|--------------------------|---|--------------|-----------------|---------------------------|
|                   |                  |                   |                    | Tolerance<br>Interval | Tolerance<br>Interval | Tolerance<br>Interval | Tolerance<br>Interval |                     |          |                       |                          |   |              |                 |                           |
| 1 Calcium (Ca)    | 41               | 40                | 98                 | .                     | .                     | 3491.2752             | 2 1183                | 2949 1578           | 255.9200 | .                     | .                        | .   | .            | .               | LOG                       |
| 2 Chromium (Cr)   | 41               | 41                | 100                | .                     | .                     | 20.0597               | 2 1183                | 17.7587             | 1 0863   | .                     | .                        | .   | .            | .               | LOG                       |
| 3 Copper (Cu)     | 41               | 32                | 78                 | .                     | .                     | 11.3487               | 2 1183                | 9.6701              | 0 7173   | 9.5531                | 0.8477                   | 0 53                                      | 0 31         | .               | LOG                       |
| 4 Lead (Pb)       | 41               | 40                | 98                 | .                     | .                     | 7 8895                | 2.1183                | 6 8275              | 0.5013   | .                     | .                        | .   | .            | .               | LOG                       |
| 5 Lithium (Li)    | 41               | 39                | 95                 | .                     | .                     | 8.0784                | 2 1183                | 7.0388              | 0 4908   | .                     | .                        | .   | .            | .               | LOG                       |
| 6 Mercury (Hg)    | 28               | 15                | 54                 | .                     | .                     | 0 2040                | 2.2458                | 0.1656              | 0 0157   | 0 1512                | 0.0235                   | 0 66                                      | 0 87         | .               | LOG                       |
| 7 Molybdenum (Mo) | 41               | 34                | 83                 | .                     | .                     | 7 6941                | 2 1183                | 6 8463              | 0 6569   | 6.5084                | 0.5597                   | 0 27                                      | 0 20         | .               | LOG                       |
| 8 Nickel (Ni)     | 41               | 38                | 93                 | .                     | .                     | 26.1999               | 2.1183                | 22 1298             | 1.9214   | .                     | .                        | .   | .            | .               | LOG                       |
| 9 Strontium (Sr)  | 41               | 1                 | 2                  | .                     | .                     | .                     | 2 1183                | 166.9678            | 38 9685  | .                     | .                        | .   | .            | .               | LOG                       |
| 10 Thallium (Tl)  | 41               | 0                 | 0                  | .                     | .                     | .                     | 2 1183                | 2 2567              | 0 1202   | .                     | .                        | .   | .            | .               | LOG                       |
| 11 Tin (Sn)       | 41               | 9                 | 22                 | .                     | .                     | .                     | 2.1183                | 66 7923             | 13.4219  | .                     | .                        | .   | .            | .               | LOG                       |
| 12 Vanadium (V)   | 41               | 40                | 98                 | .                     | .                     | 29 8145               | 2.1183                | 26 9557             | 1 3495   | .                     | .                        | .   | .            | .               | LOG                       |
| 13 Zinc (Zn)      | 39               | 34                | 87                 | .                     | .                     | 27.6637               | 2.1330                | 21.2697             | 2 9977   | .                     | .                        | .   | .            | .               | LOG                       |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values.

Tolerance Interval Calculations for Inorganic Concentrations in  
Background Rocky Flats Alluvial Borehole Samples  
(Concentration units mg/kg except pH)

| <u>Analyte</u> | <u>No of<br/>Samples</u> | <u>No. of<br/>Detects</u> | <u>Percent<br/>Detects</u> | <u>Lower</u>                  |                 | <u>Upper</u>                  |                 | <u>Tolerance<br/>Factor</u> | <u>Mean</u> | <u>Standard<br/>Deviation</u> | <u>Cohen<br/>Revised</u> |                  | <u>Cohen<br/>Tau</u> | <u>Cohen<br/>Lambda</u> | <u>Data<br/>Distrib-<br/>ution</u> |
|----------------|--------------------------|---------------------------|----------------------------|-------------------------------|-----------------|-------------------------------|-----------------|-----------------------------|-------------|-------------------------------|--------------------------|------------------|----------------------|-------------------------|------------------------------------|
|                |                          |                           |                            | <u>Tolerance<br/>Interval</u> | <u>Interval</u> | <u>Tolerance<br/>Interval</u> | <u>Interval</u> |                             |             |                               | <u>Mean</u>              | <u>Deviation</u> |                      |                         |                                    |
| 1 Lab pH       | 62                       | 62                        | 100                        | 6.3858                        | 9.5174          | 2.0150                        | 7.9516          | 0.7771                      | .           | .                             | .                        | .                | .                    | .                       | NORMAL                             |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values.

Tolerance Interval Calculations for Inorganic Concentrations in  
Background North Rocky Flats Rocky Flats Alluvial Borehole Samples  
(Concentration units mg/kg except pH)

| <u>Analyte</u>    | <u>No. of<br/>Samples</u> | <u>No of<br/>Detects</u> | <u>Percent<br/>Detects</u> | <u>Lower</u>    |                 | <u>Upper</u>    |                 | <u>Tolerance<br/>Factor</u> | <u>Mean</u> | <u>Standard<br/>Deviation</u> | <u>Cohen<br/>Revised<br/>Mean</u> |  | <u>Cohen<br/>Revised<br/>Standard<br/>Deviation</u> | <u>Cohen<br/>Tau</u> | <u>Cohen<br/>Lambda</u> | <u>Data<br/>Distrib-<br/>ution</u> |
|-------------------|---------------------------|--------------------------|----------------------------|-----------------|-----------------|-----------------|-----------------|-----------------------------|-------------|-------------------------------|-----------------------------------|--|---|----------------------|-------------------------|------------------------------------|
|                   |                           |                          |                            | <u>Interval</u> | <u>Interval</u> | <u>Interval</u> | <u>Interval</u> |                             |             |                               |                                   |  |   |                      |                         |                                    |
| 1 Nitrate/Nitrite | 30                        | 4                        | 13                         |                 |                 |                 |                 | 2 2198                      | 0 8583      | 0 8701                        |                                   |  |   |                      |                         | NORMAL                             |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values

Tolerance Interval Calculations for Inorganic Concentrations in  
Background South Rocky Flats Rocky Flats Alluvial Borehole Samples  
(Concentration units mg/kg except pH)

| <u>Analyte</u>    | <u>No of<br/>Samples</u> | <u>No. of<br/>Detects</u> | <u>Percent<br/>Detects</u> | <u>Lower</u>    |                 | <u>Upper</u>    |                 | <u>Tolerance<br/>Factor</u> | <u>Mean</u> | <u>Standard<br/>Deviation</u> | <u>Cohen<br/>Revised</u> |                  | <u>Cohen<br/>Tau</u> | <u>Cohen<br/>Lambda</u> | <u>Data<br/>Distrib-<br/>ution</u> |
|-------------------|--------------------------|---------------------------|----------------------------|-----------------|-----------------|-----------------|-----------------|-----------------------------|-------------|-------------------------------|--------------------------|------------------|----------------------|-------------------------|------------------------------------|
|                   |                          |                           |                            | <u>Interval</u> | <u>Interval</u> | <u>Interval</u> | <u>Interval</u> |                             |             |                               | <u>Mean</u>              | <u>Deviation</u> |                      |                         |                                    |
| 1 Nitrate/Nitrite | 32                       | 11                        | 34                         | .               | .               | .               | .               | 2.1968                      | 0 9828      | 0 7055                        |                          |                  |                      |                         | NORMAL                             |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values.

Tolerance Interval Calculations for Total Radiochemical Concentrations in  
Background Rocky Flats Alluvial Borehole Samples  
(Concentration units pCi/g except Tritium units pCi/ml)

| Analyte              | No. of<br>Samples | No. of<br>Detects | Percent<br>Detects | Lower                 |          | Upper                 |          | Tolerance<br>Factor | Mean   | Standard<br>Deviation | Cohen<br>Revised |                       | Cohen<br>Tau | Cohen<br>Lambda | Data<br>Distrib-<br>ution |
|----------------------|-------------------|-------------------|--------------------|-----------------------|----------|-----------------------|----------|---------------------|--------|-----------------------|------------------|-----------------------|--------------|-----------------|---------------------------|
|                      |                   |                   |                    | Tolerance<br>Interval | Interval | Tolerance<br>Interval | Interval |                     |        |                       | Mean             | Standard<br>Deviation |              |                 |                           |
| 1 Americium-241      | 27                | 27                | 100                | .                     | .        | 0.0135                | 2.2600   | -0.0015             | 0.0066 | 0.0066                | .                | .                     | .            | .               | NORMAL                    |
| 2 Cesium-137         | 64                | 64                | 100                | .                     | .        | 0.0669                | 2.0082   | 0.0063              | 0.0302 | 0.0302                | .                | .                     | .            | .               | NORMAL                    |
| 3 Gross Alpha        | 64                | 64                | 100                | .                     | .        | 38.3636               | 2.0082   | 21.5016             | 8.3964 | 8.3964                | .                | .                     | .            | .               | NORMAL                    |
| 4 Gross Beta         | 64                | 64                | 100                | .                     | .        | 36.8150               | 2.0082   | 23.4844             | 6.6380 | 6.6380                | .                | .                     | .            | .               | NORMAL                    |
| 5 Plutonium-239      | 64                | 64                | 100                | .                     | .        | 0.0150                | 2.0082   | 0.0020              | 0.0065 | 0.0065                | .                | .                     | .            | .               | NORMAL                    |
| 6 Radium-226         | 59                | 59                | 100                | .                     | .        | 0.6513                | 2.0259   | 0.6237              | 0.0136 | 0.0136                | .                | .                     | .            | .               | LOG                       |
| 7 Radium-228         | 59                | 59                | 100                | .                     | .        | 1.9561                | 2.0259   | 1.3220              | 0.3130 | 0.3130                | .                | .                     | .            | .               | NORMAL                    |
| 8 Strontium-90       | 64                | 64                | 100                | .                     | .        | 0.7256                | 2.0082   | 0.0344              | 0.3442 | 0.3442                | .                | .                     | .            | .               | NORMAL                    |
| 9 Tritium            | 64                | 64                | 100                | .                     | .        | 0.4147                | 2.0082   | 0.1773              | 0.1182 | 0.1182                | .                | .                     | .            | .               | NORMAL                    |
| 10 Uranium-233, -234 | 64                | 64                | 100                | .                     | .        | 0.6558                | 2.0082   | 0.5923              | 0.0316 | 0.0316                | .                | .                     | .            | .               | LOG                       |
| 11 Uranium-235       | 64                | 64                | 100                | .                     | .        | 0.0741                | 2.0082   | 0.0109              | 0.0315 | 0.0315                | .                | .                     | .            | .               | NORMAL                    |
| 12 Uranium-238       | 64                | 64                | 100                | .                     | .        | 0.6830                | 2.0082   | 0.6154              | 0.0336 | 0.0336                | .                | .                     | .            | .               | LOG                       |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values.

Tolerance Interval Calculations for Total Metal Concentrations in  
Background Colluvial, Weathered Claystone and Weathered Sandstone Borehole Samples  
(Concentration units mg/kg)

| Analyte           | No. of<br>Samples | No. of<br>Detects | Percent<br>Detects | Lower                 |                       | Upper                 |                       | Tolerance<br>Factor | Mean   | Standard<br>Deviation | Cohen<br>Revised |                       | Cohen<br>Tau | Cohen<br>Lambda | Data<br>Distribution |
|-------------------|-------------------|-------------------|--------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|--------|-----------------------|------------------|-----------------------|--------------|-----------------|----------------------|
|                   |                   |                   |                    | Tolerance<br>Interval | Tolerance<br>Interval | Tolerance<br>Interval | Tolerance<br>Interval |                     |        |                       | Mean             | Standard<br>Deviation |              |                 |                      |
| 1 Aluminum (Al)   | 46                | 46                | 100                |                       | 10427.7752            | 2.0865                | 8762.0760             | 798 3317            |        |                       |                  |                       |              |                 | LOG                  |
| 2 Antimony (Sb)   | 30                | 2                 | 7                  |                       |                       | 2.2198                | 14.1232               | 0 1456              |        |                       |                  |                       |              |                 | LOG                  |
| 3 Arsenic (As)    | 46                | 28                | 61                 |                       | 4.0203                | 2 0865                | 3 5686                | 0 2602              | 3.2776 | 0.3559                | 0 49             | 0 71                  |              |                 | LOG                  |
| 4 Barium (Ba)     | 46                | 42                | 91                 |                       | 121.8903              | 2 0865                | 104 4600              | 8 3539              |        |                       |                  |                       |              |                 | LOG                  |
| 5 Beryllium (Be)  | 46                | 44                | 96                 |                       | 3.4013                | 2 0865                | 2.9791                | 0 2023              |        |                       |                  |                       |              |                 | LOG                  |
| 6 Cadmium (Cd)    | 41                | 0                 | 0                  |                       |                       | 2 1183                | 1.1634                | 0 0084              |        |                       |                  |                       |              |                 | LOG                  |
| 7 Cesium (Cs)     | 36                | 0                 | 0                  |                       |                       | 2 1577                | 231.9456              | 1 8856              |        |                       |                  |                       |              |                 | LOG                  |
| 8 Cobalt (Co)     | 46                | 6                 | 13                 |                       |                       | 2 0865                | 12 4683               | 0 3242              |        |                       |                  |                       |              |                 | LOG                  |
| 9 Iron (Fe)       | 45                | 45                | 100                |                       | 14726 3649            | 2 0924                | 12589.9332            | 1021 0666           |        |                       |                  |                       |              |                 | LOG                  |
| 10 Magnesium (Mg) | 46                | 44                | 96                 |                       | 2799 1426             | 2 0865                | 2492.8544             | 146 7970            |        |                       |                  |                       |              |                 | LOG                  |
| 11 Manganese (Mn) | 46                | 46                | 100                |                       | 203 0125              | 2 0865                | 155.7160              | 22 6681             |        |                       |                  |                       |              |                 | LOG                  |
| 12 Potassium (K)  | 46                | 14                | 30                 |                       |                       | 2 0865                | 1305.3062             | 41 0626             |        |                       |                  |                       |              |                 | LOG                  |
| 13 Selenium (Se)  | 42                | 0                 | 0                  |                       |                       | 2 1114                | 3.3527                | 0 4804              |        |                       |                  |                       |              |                 | LOG                  |
| 14 Silver (Ag)    | 34                | 8                 | 24                 |                       |                       | 2 1762                | 4 9503                | 0 7988              |        |                       |                  |                       |              |                 | LOG                  |
| 15 Sodium (Na)    | 46                | 2                 | 4                  |                       |                       | 2 0865                | 1202 3053             | 48 3913             |        |                       |                  |                       |              |                 | LOG                  |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values.

Tolerance Interval Calculations for Total Metal Concentrations in  
Background North Rocky Flats Colluvial, Weathered Claystone and Weathered Sandstone Borehole Samples  
(Concentration Units mg/kg)

| Analyte          | No. of<br>Samples | No. of<br>Detects | Percent<br>Detects | Lower                 |  | Upper                 |  | Tolerance<br>Factor | Mean      |  | Standard<br>Deviation |  | Cohen<br>Revised |                       | Cohen<br>Tau | Cohen<br>Lambda | Data<br>Distrib-<br>ution |
|------------------|-------------------|-------------------|--------------------|-----------------------|--|-----------------------|--|---------------------|-----------|--|-----------------------|--|------------------|-----------------------|--------------|-----------------|---------------------------|
|                  |                   |                   |                    | Tolerance<br>Interval |  | Tolerance<br>Interval |  |                     |           |  |                       |  | Mean             | Standard<br>Deviation |              |                 |                           |
| 1 Calcium (Ca)   | 31                | 31                | 100                | .                     |  | 7566.5613             |  | 2.2080              | 6330.0302 |  | 560.0235              |  | .                |                       |              |                 | LOG                       |
| 2 Chromium (Cr)  | 31                | 31                | 100                | .                     |  | 10.3477               |  | 2.2080              | 8.8363    |  | 0.6845                |  |                  |                       |              |                 | LOG                       |
| 3 Copper (Cu)    | 30                | 29                | 97                 | .                     |  | 16.2533               |  | 2.2198              | 14.2801   |  | 0.8889                |  | .                |                       |              |                 | LOG                       |
| 4 Lead (Pb)      | 31                | 31                | 100                | .                     |  | 18.6811               |  | 2.2080              | 16.7633   |  | 0.8686                |  | .                |                       |              |                 | LOG                       |
| 5 Lithium (Li)   | 31                | 25                | 81                 | .                     |  | 11.6003               |  | 2.2080              | 9.0192    |  | 1.0748                |  | 1.0191           | 0.14                  | 0.26         |                 | LOG                       |
| 6 Mercury (Hg)   | 30                | 9                 | 30                 |                       |  | .                     |  | 2.2198              | 0.1667    |  | 0.0141                |  | .                |                       |              |                 | LOG                       |
| 7 Molybdenum(Mo) | 31                | 23                | 74                 |                       |  | 13.4310               |  | 2.2080              | 10.3654   |  | 1.3884                |  | .                |                       | 4.42         |                 | LOG                       |
| 8 Nickel (Ni)    | 28                | 25                | 89                 |                       |  | 20.1842               |  | 2.2458              | 16.6965   |  | 1.5530                |  | .                |                       |              |                 | LOG                       |
| 9 Strontium (Sr) | 31                | 30                | 97                 |                       |  | 64.0675               |  | 2.2080              | 55.7825   |  | 3.7523                |  | .                |                       |              |                 | LOG                       |
| 10 Thallium (Tl) | 30                | 1                 | 3                  |                       |  | .                     |  | 2.2198              | 2.3167    |  | 0.0222                |  | .                |                       |              |                 | LOG                       |
| 11 Tin (Sn)      | 22                | 8                 | 36                 | .                     |  | .                     |  | 2.3490              | 120.9295  |  | 39.0482               |  | .                |                       |              |                 | LOG                       |
| 12 Vanadium (V)  | 25                | 22                | 88                 | .                     |  | 23.7320               |  | 2.2917              | 20.5495   |  | 1.3887                |  | .                |                       | .            |                 | LOG                       |
| 13 Zinc (Zn)     | 31                | 31                | 100                | .                     |  | 62.3409               |  | 2.2080              | 54.0536   |  | 3.7533                |  | .                |                       |              |                 | LOG                       |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values.

Tolerance Interval Calculations for Total Metal Concentrations in  
Background South Rocky Flats Colluvial, Weathered Claystone and Weathered Sandstone Borehole Samples  
(Concentration units mg/kg)

| Analyte           | No. of<br>Samples | No. of<br>Detects | Percent<br>Detects | Lower<br>Tolerance<br>Interval | Upper<br>Tolerance<br>Interval | Tolerance<br>Factor | Mean      | Standard<br>Deviation | Cohen<br>Revised<br>Mean | Cohen<br>Revised<br>Standard<br>Deviation | Cohen<br>Tau | Cohen<br>Lambda | Data<br>Distrib-<br>ution |
|-------------------|-------------------|-------------------|--------------------|--------------------------------|--------------------------------|---------------------|-----------|-----------------------|--------------------------|---|--------------|-----------------|---------------------------|
| 1 Calcium (Ca)    | 15                | 15                | 100                | .                              | 12314 5488                     | 2.5660              | 8399 2202 | 1525.8488             | .                        | .   | .            | .               | LOG                       |
| 2 Chromium (Cr)   | 15                | 15                | 100                | .                              | 18.7974                        | 2.5660              | 14.8033   | 1.5565                | .                        | .   | .            | .               | LOG                       |
| 3 Copper (Cu)     | 15                | 14                | 93                 | .                              | 17 0035                        | 2.5660              | 13 3473   | 1.4249                | .                        | .   | .            | .               | LOG                       |
| 4 Lead (Pb)       | 15                | 15                | 100                | .                              | 21 3174                        | 2.5660              | 17.1722   | 1.6154                | .                        | .   | .            | .               | LOG                       |
| 5 Lithium (Li)    | 15                | 15                | 100                | .                              | 12 1433                        | 2.5660              | 8.8951    | 1.2659                | .                        | .   | .            | .               | LOG                       |
| 6 Mercury (Hg)    | 15                | 8                 | 53                 | .                              | 0 1496                         | 2.5660              | 0 1322    | 0.0082                | 0 1212                   | 0.0111                                    | 0.79         | 0.90            | LOG                       |
| 7 Molybdenum (Mo) | 15                | 14                | 93                 | .                              | 20.8220                        | 2.5660              | 14.1638   | 2.5948                | .                        | .   | .            | .               | LOG                       |
| 8 Nickel (Ni)     | 15                | 11                | 73                 | .                              | 23.2001                        | 2.5660              | 17 3397   | 1.9600                | 17.0844                  | 2.3833                                    | 0 18         | 0.34            | LOG                       |
| 9 Strontium (Sr)  | 15                | 15                | 100                | .                              | 93.4362                        | 2.5660              | 71.5932   | 8 5125                | .                        | .   | .            | .               | LOG                       |
| 10 Thallium (Tl)  | 8                 | 0                 | 0                  | .                              | .                              | 3 1873              | 2 3375    | 0.0322                | .                        | .   | .            | .               | LOG                       |
| 11 Tin (Sn)       | 15                | 0                 | 0                  | .                              | .                              | 2.5660              | 23.8599   | 0 2369                | .                        | .   | .            | .               | LOG                       |
| 12 Vanadium (V)   | 15                | 15                | 100                | .                              | 43 5171                        | 2.5660              | 34 3487   | 3.5730                | .                        | .   | .            | .               | LOG                       |
| 13 Zinc (Zn)      | 15                | 15                | 100                | .                              | 76.6957                        | 2.5660              | 59.7989   | 6 5849                | .                        | .   | .            | .               | LOG                       |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values.

Tolerance Interval Calculations for Inorganic Concentrations in  
Background Colluvial, Weathered Claystone and Weathered Sandstone Borehole Samples  
(Concentration units mg/kg except pH)

| <u>Analyte</u> | <u>No. of<br/>Samples</u> | <u>No of<br/>Detects</u> | <u>Percent<br/>Detects</u> | <u>Lower</u>                  |                               | <u>Upper</u>                  |                               | <u>Tolerance<br/>Factor</u> | <u>Mean</u> | <u>Standard<br/>Deviation</u> | <u>Cohen<br/>Revised</u> |                  | <u>Cohen<br/>Tau</u> | <u>Cohen<br/>Lambda</u> | <u>Data<br/>Distrib-<br/>ution</u> |
|----------------|---------------------------|--------------------------|----------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-----------------------------|-------------|-------------------------------|--------------------------|------------------|----------------------|-------------------------|------------------------------------|
|                |                           |                          |                            | <u>Tolerance<br/>Interval</u> | <u>Tolerance<br/>Interval</u> | <u>Tolerance<br/>Interval</u> | <u>Tolerance<br/>Interval</u> |                             |             |                               | <u>Mean</u>              | <u>Deviation</u> |                      |                         |                                    |
| 1 Lab pH       | 53                        | 53                       | 100                        | 7.2914                        | 9 5161                        | 2 0507                        | 8.4038                        | 0.5424                      |             |                               |                          |                  |                      |                         | NORMAL                             |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values.

Tolerance Interval Calculations for Inorganic Concentrations in  
Background North Rocky Flats Colluvial, Weathered Claystone and Weathered Sandstone Borehole Samples  
(Concentration units mg/kg except pH)

| <u>Analyte</u>    | <u>No. of<br/>Samples</u> | <u>No. of<br/>Detects</u> | <u>Percent<br/>Detects</u> | <u>Lower</u>                  |                 | <u>Upper</u>                  |                 | <u>Tolerance<br/>Factor</u> | <u>Mean</u> | <u>Standard<br/>Deviation</u> | <u>Cohen<br/>Revised</u> |                  | <u>Cohen<br/>Tau</u> | <u>Cohen<br/>Lambda</u> | <u>Data<br/>Distrib-<br/>ution</u> |
|-------------------|---------------------------|---------------------------|----------------------------|-------------------------------|-----------------|-------------------------------|-----------------|-----------------------------|-------------|-------------------------------|--------------------------|------------------|----------------------|-------------------------|------------------------------------|
|                   |                           |                           |                            | <u>Tolerance<br/>Interval</u> | <u>Interval</u> | <u>Tolerance<br/>Interval</u> | <u>Interval</u> |                             |             |                               | <u>Mean</u>              | <u>Deviation</u> |                      |                         |                                    |
| 1 Nitrate/Nitrite | 32                        | 10                        | 31                         | .                             | .               | 2.1968                        | 0.8953          | 0.5303                      | .           | .                             | .                        | .                | .                    | .                       | NORMAL                             |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values

Tolerance Interval Calculations for Inorganic Concentrations in  
Background South Rocky Flats Colluvial, Weathered Claystone and Weathered Sandstone Borehole Samples  
(Concentration units mg/kg except pH)

| Analyte           | No of<br>Samples | No. of<br>Detects | Percent<br>Detects | Lower<br>Tolerance<br>Interval | Upper<br>Tolerance<br>Interval | Tolerance<br>Factor | Mean   | Standard<br>Deviation | Cohen<br>Revised<br>Mean | Cohen<br>Revised<br>Standard<br>Deviation | Cohen<br>Tau | Cohen<br>Lambda | Data<br>Distrib-<br>ution |
|-------------------|------------------|-------------------|--------------------|--------------------------------|--------------------------------|---------------------|--------|-----------------------|--------------------------|---|--------------|-----------------|---------------------------|
| 1 Nitrate/Nitrite | 21               | 15                | 71                 | .                              | 4.6824                         | 2.3714              | 1.7167 | 1.0375                | 1.4430                   | 1.3660                                    | 0.29         | 0.46            | NORMAL                    |

NORMAL=Normal data distribution assumed LOG=Log normal data distribution assumed = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values.

Tolerance Interval Calculations for Total Radiochemical Concentrations in  
Background Colluvial, Weathered Claystone and Weathered Sandstone Borehole Samples  
(Concentration units pCi/g except Tritium units pCi/ml)

| Analyte            | No of<br>Samples | No. of<br>Detects | Percent<br>Detects | Lower                 |          | Upper                 |          | Tolerance<br>Factor | Mean    | Standard<br>Deviation | Cohen<br>Revised |                       | Cohen<br>Tau | Cohen<br>Lambda | Data<br>Distrib-<br>ution |
|--------------------|------------------|-------------------|--------------------|-----------------------|----------|-----------------------|----------|---------------------|---------|-----------------------|------------------|-----------------------|--------------|-----------------|---------------------------|
|                    |                  |                   |                    | Tolerance<br>Interval | Interval | Tolerance<br>Interval | Interval |                     |         |                       | Mean             | Standard<br>Deviation |              |                 |                           |
| 1 Cesium-137       | 54               | 54                | 100                | .                     | .        | 0.0745                | 0.074    | 2.0463              | 0.0074  | 0.0328                | .                | .                     | .            | .               | NORMAL                    |
| 2 Gross Alpha      | 54               | 54                | 100                | .                     | .        | 48.4255               | 30.6852  | 2.0463              | 30.6852 | 8.6697                | .                | .                     | .            | .               | NORMAL                    |
| 3 Gross Beta       | 54               | 54                | 100                | .                     | .        | 34.1512               | 26.2593  | 2.0463              | 26.2593 | 3.8568                | .                | .                     | .            | .               | NORMAL                    |
| 4 Plutonium-239    | 54               | 54                | 100                | .                     | .        | 0.0209                | 0.0046   | 2.0463              | 0.0046  | 0.0079                | .                | .                     | .            | .               | NORMAL                    |
| 5 Radium-226       | 38               | 38                | 100                | .                     | .        | 1.1379                | 1.0769   | 2.1408              | 1.0769  | 0.0285                | .                | .                     | .            | .               | LOG                       |
| 6 Radium-228       | 38               | 38                | 100                | .                     | .        | 2.0537                | 1.4447   | 2.1408              | 1.4447  | 0.2845                | .                | .                     | .            | .               | NORMAL                    |
| 7 Strontium-90     | 54               | 54                | 100                | .                     | .        | 0.6719                | -0.0759  | 2.0463              | -0.0759 | 0.3655                | .                | .                     | .            | .               | NORMAL                    |
| 8 Tritium          | 54               | 54                | 100                | .                     | .        | 0.2875                | 0.0550   | 2.0463              | 0.0550  | 0.1136                | .                | .                     | .            | .               | NORMAL                    |
| 9 Uranium-233,-234 | 54               | 54                | 100                | .                     | .        | 0.9830                | 0.8788   | 2.0463              | 0.8788  | 0.0509                | .                | .                     | .            | .               | LOG                       |
| 10 Uranium-235     | 54               | 54                | 100                | .                     | .        | 0.1756                | 0.0407   | 2.0463              | 0.0407  | 0.0659                | .                | .                     | .            | .               | NORMAL                    |
| 11 Uranium-238     | 54               | 54                | 100                | .                     | .        | 1.0429                | 0.9575   | 2.0463              | 0.9575  | 0.0417                | .                | .                     | .            | .               | LOG                       |

NORMAL=Normal data distribution assumed LOG=log normal data distribution assumed . = result is not applicable  
Statistics for log normal distributions are presented as untransformed (antilog) values.

**APPENDIX C**

**LIST OF OUTLIERS  
FOR ALL  
SAMPLE MEDIA**

ASTM Outlier Tests of Total Metal Concentrations in Sediment  
(Concentration units mg/kg)

| Analyte     | Sample Number | Sample Date | Location | Outlier    | Qualifier | Total Values | Mean      | Standard Deviation | Difference Result-Mean | Outlier Test Statistic | ASTM Critical Value |
|-------------|---------------|-------------|----------|------------|-----------|--------------|-----------|--------------------|------------------------|------------------------|---------------------|
| 1 ALUMINIUM | SED19001      | 02/23/89    | SED019   | 21600.0000 | V         | 18           | 5203.8889 | 5099.0946          | 16396.111              | 3.215                  | 2.504               |
| 2 ARSENIC   | SED19001      | 02/23/89    | SED019   | 13.0000    | A         | 19           | 2.3763    | 2.9133             | 10.624                 | 3.647                  | 2.532               |
| 3 CALCIUM   | SED21001      | 02/22/89    | SED021   | 52500.0000 | V         | 19           | 5953.4211 | 12226.3745         | 46546.579              | 3.807                  | 2.532               |
| 4 LEAD      | SED18001      | 02/23/89    | SED018   | 49.1000    | A         | 19           | 12.1579   | 12.1596            | 36.942                 | 3.038                  | 2.532               |
| 5 MAGNESIUM | SED19001      | 02/23/89    | SED019   | 4110.0000  | V         | 19           | 1163.6842 | 938.9945           | 2946.316               | 3.138                  | 2.532               |
| 6 NICKEL    | SED19001      | 02/23/89    | SED019   | 29.9000    | A         | 18           | 8.6722    | 6.4137             | 21.228                 | 3.310                  | 2.504               |
| 7 SILVER    | SED21001      | 02/22/89    | SED021   | 6.8000     | V         | 15           | 1.7833    | 1.5111             | 5.017                  | 3.320                  | 2.409               |
| 8 VANADIUM  | SED19001      | 02/23/89    | SED019   | 50.2000    | V         | 17           | 16.6118   | 11.1956            | 33.588                 | 3.000                  | 2.475               |

U=Analyzed but not detected  
A=Acceptable with qualifications  
J=Present below detection limit  
V=Valid and acceptable  
E=Estimated value  
R=Rejected

ASTM Outlier Tests of Inorganic Concentrations in Sediment  
(Concentration units mg/kg except pH)

| <u>Analyte</u>    | <u>Sample<br/>Number</u> | <u>Sample<br/>Date</u> | <u>Location</u> | <u>Outlier</u> | <u>Qualifier</u> | <u>Total<br/>Values</u> | <u>Mean</u> | <u>Standard<br/>Deviation</u> | <u>Difference<br/>Result-Mean</u> | <u>Outlier<br/>Test<br/>Statistic</u> | <u>ASTM<br/>Critical<br/>Value</u> |
|-------------------|--------------------------|------------------------|-----------------|----------------|------------------|-------------------------|-------------|-------------------------------|-----------------------------------|---------------------------------------|------------------------------------|
| 1 NITRATE/NITRITE | SED021001B               | 10/27/89               | SED021          | 13             | V                | 19                      | 1.5974      | 2.7863                        | 11.403                            | 4.092                                 | 2.532                              |

U=Analyzed but not detected      J=Present below detection limit      E=Estimated value  
A=Acceptable with qualifications      V=Valid and acceptable      R=Rejected

ASTM Outlier Tests of Total Radiochemical Concentrations in Sediment  
(Concentration units pCi/g except Tritium units pCi/ml)

| Analyte         | Sample Number | Sample Date | Location | Outlier | Qualifier | Total Values | Mean   | Standard Deviation | Difference Result-Mean | Outlier Test Statistic | ASTM Critical Value |
|-----------------|---------------|-------------|----------|---------|-----------|--------------|--------|--------------------|------------------------|------------------------|---------------------|
| 1 CESIUM-137    | SED 19001     | 10/30/89    | SED019   | 3.2000  |           | 19           | 0.5705 | 0.8359             | 2.629                  | 3.146                  | 2.532               |
| 2 PLUTONIUM-239 | SED 21001     | 02/22/89    | SED021   | 0.0800  |           | 19           | 0.0174 | 0.0235             | 0.063                  | 2.661                  | 2.532               |
| 3 URANIUM-235   | SED 16001     | 10/30/89    | SED016   | 1.3400  |           | 19           | 0.1574 | 0.3358             | 1.183                  | 3.522                  | 2.532               |

U=Analyzed but not detected      J=Present below detection limit      E=Estimated value  
A=Acceptable with qualifications      V=Valid and acceptable      R=Rejected

ASTM Outlier Tests of Total Metal Concentrations in Surface Water  
(Concentration units mg/l)

| Analyte      | Sample Number | Sample Date | Location | Outlier   | Qualifier | Total Values | Mean    | Standard Deviation | Difference Result-Mean | Outlier Test Statistic | ASTM Critical Value |
|--------------|---------------|-------------|----------|-----------|-----------|--------------|---------|--------------------|------------------------|------------------------|---------------------|
| 1 ALUMINUM   | SW080003      | 06/16/89    | SW080    | 293.0000  | V         | 52           | 11.7200 | 42.3362            | 281.280                | 6.644                  | 2.976               |
| 2 ARSENIC    | SW080003      | 06/16/89    | SW080    | 1.0300    | V         | 55           | 0.0366  | 0.1535             | 0.993                  | 6.472                  | 2.998               |
| 3 BARIUM     | SW080001      | 03/01/89    | SW080    | 4.4900    | V         | 56           | 0.3942  | 1.0031             | 4.096                  | 4.083                  | 3.005               |
| 4 BERYLLIUM  | SW080003      | 06/16/89    | SW080    | 0.0107    | A         | 52           | 0.0028  | 0.0018             | 0.008                  | 4.445                  | 2.976               |
| 5 CADMIUM    | SW080003      | 06/16/89    | SW080    | 0.0644    | V         | 51           | 0.0039  | 0.0088             | 0.060                  | 6.842                  | 2.968               |
| 6 CALCIUM    | SW080003      | 06/16/89    | SW080    | 803.0000  | V         | 56           | 60.2500 | 115.5452           | 742.750                | 6.428                  | 3.005               |
| 7 CESIUM     | SW080001      | 03/01/89    | SW080    | 2.5300    | V         | 56           | 0.6541  | 0.4005             | 1.876                  | 4.684                  | 3.005               |
| 8 CHROMIUM   | SW080003      | 06/16/89    | SW080    | 0.2750    | A         | 48           | 0.0162  | 0.0407             | 0.259                  | 6.363                  | 2.943               |
| 9 COBALT     | SW080003      | 06/16/89    | SW080    | 0.4890    | V         | 51           | 0.0357  | 0.0658             | 0.453                  | 6.894                  | 2.968               |
| 10 COPPER    | SW080003      | 06/16/89    | SW080    | 0.6070    | V         | 55           | 0.0328  | 0.0854             | 0.574                  | 6.722                  | 2.998               |
| 11 IRON      | SW080003      | 06/16/89    | SW080    | 3220.0000 | V         | 56           | 94.8165 | 450.0459           | 3125.184               | 6.944                  | 3.005               |
| 12 LEAD      | SW080003      | 06/16/89    | SW080    | 0.5160    | V         | 54           | 0.0370  | 0.1013             | 0.479                  | 4.729                  | 2.991               |
| 13 MAGNESIUM | SW108009      | 12/05/89    | SW108    | 28.5000   |           | 56           | 7.0704  | 5.7218             | 21.430                 | 3.745                  | 3.005               |
| 14 MANGANESE | SW080003      | 06/16/89    | SW080    | 27.7000   | A         | 56           | 0.8640  | 3.7755             | 26.836                 | 7.108                  | 3.005               |
| 15 MERCURY   | SW004003      | 06/15/89    | SW004    | 0.0014    |           | 48           | 0.0002  | 0.0003             | 0.001                  | 3.890                  | 2.943               |
| 16 NICKEL    | SW080003      | 06/16/89    | SW080    | 0.6460    | V         | 46           | 0.0394  | 0.0982             | 0.607                  | 6.180                  | 2.926               |
| 17 POTASSIUM | SW080004      | 07/14/89    | SW080    | 10.2000   | V         | 53           | 2.9749  | 1.7053             | 7.225                  | 4.237                  | 2.983               |
| 18 SILVER    | SW080001      | 03/01/89    | SW080    | 0.1480    | V         | 54           | 0.0093  | 0.0199             | 0.139                  | 6.986                  | 2.991               |
| 19 STRONTIUM | SW080004      | 07/14/89    | SW080    | 1.4600    | V         | 56           | 0.3952  | 0.2692             | 1.065                  | 3.955                  | 3.005               |
| 20 TIN       | SW080001      | 03/01/89    | SW080    | 0.9690    | V         | 56           | 0.1100  | 0.1808             | 0.859                  | 4.751                  | 3.005               |
| 21 VANADIUM  | SW080003      | 06/16/89    | SW080    | 1.6500    | V         | 55           | 0.0761  | 0.2307             | 1.574                  | 6.823                  | 2.998               |
| 22 ZINC      | SW080003      | 06/16/89    | SW080    | 2.6800    | A         | 54           | 0.1628  | 0.3835             | 2.517                  | 6.563                  | 2.991               |

U=Analyzed but not detected  
A=Acceptable with qualifications  
J=Present below detection limit  
V=Valid and acceptable  
E=Estimated value  
R=Rejected

ASTM Outlier Tests of Dissolved Metal Concentrations in Surface Water  
(Concentration units mg/l)

| Analyte      | Sample Number | Sample Date | Location | Outlier | Qualifier | Total Values | Mean    | Standard Deviation | Difference Result-Mean | Outlier Test Statistic | ASTM Critical Value |
|--------------|---------------|-------------|----------|---------|-----------|--------------|---------|--------------------|------------------------|------------------------|---------------------|
|              |               |             |          |         |           |              |         |                    |                        |                        |                     |
| 1 ALUMINUM   | SW06001       | 02/24/89    | SW006    | 0.485   |           | 48           | 0.1166  | 0.0827             | 0.368                  | 4.455                  | 2.943               |
| 2 ARSENIC    | SW108004      | 07/13/89    | SW108    | 0.018   | V         | 54           | 0.0049  | 0.0021             | 0.013                  | 6.229                  | 2.991               |
| 3 BARIUM     | SW080003      | 06/16/89    | SW080    | 0.211   | V         | 57           | 0.0967  | 0.0247             | 0.114                  | 4.626                  | 3.011               |
| 4 CALCIUM    | SW108009      | 12/05/89    | SW108    | 216     |           | 58           | 32.9190 | 28.8936            | 183.081                | 6.336                  | 3.018               |
| 5 COPPER     | SW108004      | 07/13/89    | SW108    | 0.0278  | A         | 56           | 0.0128  | 0.0028             | 0.015                  | 5.371                  | 3.005               |
| 6 IRON       | SW080003      | 06/16/89    | SW080    | 16.7    | V         | 57           | 0.6777  | 2.2671             | 16.022                 | 7.067                  | 3.011               |
| 7 LEAD       | SW006002      | 05/31/89    | SW006    | 0.0131  | V         | 54           | 0.0027  | 0.0017             | 0.010                  | 6.230                  | 2.991               |
| 8 LITHIUM    | SW0060090     | 12/04/89    | SW006    | 0.102   |           | 58           | 0.0428  | 0.0188             | 0.059                  | 3.151                  | 3.018               |
| 9 MAGNESIUM  | SW108009      | 12/05/89    | SW108    | 27.4    |           | 58           | 5.1486  | 4.0283             | 22.251                 | 5.524                  | 3.018               |
| 10 MANGANESE | SW107004      | 07/14/89    | SW107    | 1.1     | V         | 56           | 0.1040  | 0.2066             | 0.996                  | 4.820                  | 3.005               |
| 11 MERCURY   | SW080001      | 03/01/89    | SW080    | 0.0013  | A         | 49           | 0.0002  | 0.0002             | 0.001                  | 6.003                  | 2.952               |
| 12 SELENIUM  | SW108009      | 12/05/89    | SW108    | 0.0124  |           | 49           | 0.0027  | 0.0017             | 0.010                  | 5.634                  | 2.952               |
| 13 STRONTIUM | SW108009      | 12/05/89    | SW108    | 0.967   |           | 58           | 0.3410  | 0.2010             | 0.626                  | 3.114                  | 3.018               |
| 14 ZINC      | SW007003      | 06/08/89    | SW007    | 0.102   | V         | 53           | 0.0180  | 0.0185             | 0.084                  | 4.548                  | 2.983               |

U=Analyzed but not detected      J=Present below detection limit      E=Estimated value  
A=Acceptable with qualifications      V=Valid and acceptable      R=Rejected

ASTM Outlier Tests of Inorganic Concentrations in Surface Water  
(Concentration units mg/l except pH)

| Analyte                  | Sample Number | Sample Date | Location | Outlier | Total     |        | Standard Deviation | Difference Result-Mean | Outlier Test Statistic | ASTM Critical Value |  |
|--------------------------|---------------|-------------|----------|---------|-----------|--------|--------------------|------------------------|------------------------|---------------------|--|
|                          |               |             |          |         | Qualifier | Values |                    |                        |                        |                     |  |
| 1 CHLORIDE               | SW007002      | 05/31/89    | SW007    | 62      | A         | 59     | 12 8898            | 49 110                 | 3.765                  | 3.024               |  |
| 2 CYANIDE                | SW108009      | 12/05/89    | SW108    | 0.0452  |           | 56     | 0 0046             | 0.041                  | 5 289                  | 3 005               |  |
| 3 HYDROGEN CARBONATE     | SW080003      | 06/16/89    | SW080    | 1900    | V         | 59     | 190.8305           | 1709 169               | 5.663                  | 3 024               |  |
| 4 NITRATE/NITRITE        | SW108009      | 12/05/89    | SW108    | 11      |           | 59     | 0 7779             | 10 222                 | 6.023                  | 3.024               |  |
| 5 SULFATE                | SW108009      | 12/05/89    | SW108    | 560     |           | 59     | 33 0508            | 526 949                | 7.418                  | 3 024               |  |
| 6 TOTAL DISSOLVED SOLIDS | SW108009      | 12/05/89    | SW108    | 1100    |           | 59     | 193 6441           | 906.356                | 6.407                  | 3.024               |  |
| 7 TOTAL SUSPENDED SOLIDS | SW080003      | 06/16/89    | SW080    | 25000   | V         | 58     | 1042.0776          | 23957.922              | 6.155                  | 3.018               |  |

U=Analyzed but not detected J=Present below detection limit E=Estimated value  
A=Acceptable with qualifications V=Valid and acceptable R=Rejected

ASTM Outlier Tests of Total Radiochemical Concentrations in Surface Water  
(Concentration units pCi/L)

| Analyte            | Sample Number | Sample Date | Location | Outlier | Qualifier | Total Values | Mean    | Standard Deviation | Difference Result-Mean | Outlier Test Statistic | ASTM Critical Value |
|--------------------|---------------|-------------|----------|---------|-----------|--------------|---------|--------------------|------------------------|------------------------|---------------------|
| 1 AMERICIUM-241    | SW080006      | 09/19/89    | SW080    | 0.372   |           | 44           | 0 0265  | 0 0717             | 0.346                  | 4 820                  | 2.907               |
| 2 CESTUM-137       | SW080001      | 03/01/89    | SW080    | 12      |           | 50           | 0 3843  | 1 7176             | 11.616                 | 6 763                  | 2.960               |
| 3 GROSS ALPHA      | SW080003      | 06/16/89    | SW080    | 440     |           | 49           | 25 5367 | 73 3749            | 414.463                | 5 649                  | 2.952               |
| 4 GROSS BETA       | SW080003      | 06/16/89    | SW080    | 420     |           | 49           | 24 2510 | 67 1246            | 395 749                | 5.896                  | 2 952               |
| 5 PLUTONIUM-239    | SW080004      | 07/14/89    | SW080    | 4.4     |           | 50           | 0 1371  | 0 6395             | 4.263                  | 6.666                  | 2.960               |
| 6 RADIUM 226       | SW080003      | 06/16/89    | SW080    | 30      |           | 13           | 5.4308  | 8 9182             | 24.569                 | 2 755                  | 2.331               |
| 7 URANIUM, TOTAL   | SW107004      | 07/14/89    | SW107    | 2.5     |           | 50           | 0.7232  | 0 5965             | 1 777                  | 2 979                  | 2.960               |
| 8 URANIUM-233,-234 | SW041008      | 11/20/89    | SW041    | 1.51    |           | 50           | 0 3898  | 0 3466             | 1 120                  | 3 232                  | 2.960               |
| 9 URANIUM-238      | SW107004      | 07/14/89    | SW107    | 1.4     |           | 50           | 0 3128  | 0 2934             | 1 087                  | 3 706                  | 2.960               |

U=Analyzed but not detected  
A=Acceptable with qualifications  
J=Present below detection limit  
V=Valid and acceptable  
E=Estimated value  
R=Rejected

ASTM Outlier Tests of Dissolved Radiochemical Concentrations in Surface Water  
(Concentration units pCi/l)

| Analyte       | Sample Number | Sample Date | Location | Outlier | Qualifier | Total Values | Mean   | Standard Deviation | Difference Result-Mean | Outlier Test Statistic | ASTM Critical Value |
|---------------|---------------|-------------|----------|---------|-----------|--------------|--------|--------------------|------------------------|------------------------|---------------------|
| 1 URANIUM-235 | SW104-001     | 03/02/89    | SW104    | 0.3000  |           | 10           | 0.0400 | 0.0966             | 0.260                  | 2.691                  | 2.176               |
| 2 URANIUM-238 | SW104-001     | 03/02/89    | SW104    | 1.7000  |           | 10           | 0.3700 | 0.5143             | 1.330                  | 2.586                  | 2.176               |

U=Analyzed but not detected  
A=Acceptable with qualifications  
J=Present below detection limit  
V=Valid and acceptable  
E=Estimated value  
R=Rejected

ASTM Outlier Tests of Dissolved Metal Concentrations in Ground Water  
(Concentration Units mg/l)

| Analyte      | Sample Number | Sample Date | Location | Outlier  | Qualifier | Total Values | Mean    | Standard Deviation | Difference  | Outlier Test | ASTH Critical Value |
|--------------|---------------|-------------|----------|----------|-----------|--------------|---------|--------------------|-------------|--------------|---------------------|
|              |               |             |          |          |           |              |         |                    | Result-Mean |              |                     |
| 1 ALUMINUM   | G35890789001  | 07/06/89    | B204089  | 0 3270   | A         | 80           | 0.0970  | 0 0431             | 0 230       | 5 332        | 3.129               |
| 2 ARSENIC    | G32890689001  | 06/27/89    | B203789  | 0 0186   |           | 87           | 0.0046  | 0 0022             | 0 014       | 6 456        | 3.156               |
| 3 BARIUM     | G24890789002  | 07/18/89    | B302889  | 0 2220   | V         | 100          | 0.0977  | 0 0179             | 0 124       | 6 926        | 3 203               |
| 4 CADMIUM    | G078910890030 | 10/11/89    | B200789  | 0.0111   | A         | 92           | 0.0026  | 0 0010             | 0 008       | 8 410        | 3.175               |
| 5 CALCIUM    | G11891089003  | 10/26/89    | B201289  | 196.0000 |           | 101          | 49 7833 | 36 0879            | 146 217     | 4 052        | 3.207               |
| 6 CHROMIUM   | G43890989002  | 09/22/89    | B405289  | 0.0177   |           | 91           | 0 0059  | 0.0022             | 0.012       | 5 244        | 3 171               |
| 7 COPPER     | G37891089003  | 10/11/89    | B304289  | 0.0695   | A         | 86           | 0.0141  | 0.0088             | 0.055       | 6 323        | 3.153               |
| 8 IRON       | G19890489001  | 04/25/89    | B102389  | 0.9440   | V         | 93           | 0.0819  | 0 1371             | 0.862       | 6 287        | 3.178               |
| 9 LEAD       | G10890789002  | 07/21/89    | B201189  | 0.0396   | V         | 96           | 0.0037  | 0.0050             | 0.036       | 7 219        | 3 189               |
| 10 LITHIUM   | G49890689001D | 06/14/89    | B405889  | 1.7900   | V         | 97           | 0.0767  | 0 1867             | 1.713       | 9 176        | 3 193               |
| 11 MAGNESIUM | G26891089003  | 10/24/89    | B203189  | 179.0000 |           | 101          | 10 9593 | 19 5126            | 168.041     | 8 612        | 3 207               |
| 12 MANGANESE | G40890889002  | 08/22/89    | B304889  | 0.8460   | V         | 99           | 0.0696  | 0.1266             | 0 776       | 6 135        | 3 200               |
| 13 MERCURY   | G31890589001  | 05/25/89    | B203689  | 0.0008   |           | 89           | 0.0001  | 0.0001             | 0.001       | 5 410        | 3 164               |
| 14 NICKEL    | G07890689001  | 06/06/89    | B200789  | 0.0432   | A         | 85           | 0.0188  | 0 0045             | 0.024       | 5 413        | 3 149               |
| 15 POTASSIUM | G35890789001  | 07/06/89    | B204089  | 21.9000  | V         | 90           | 3.4125  | 3.4059             | 18 487      | 5 428        | 3.168               |
| 16 SELENIUM  | G11891089003  | 10/26/89    | B201289  | 0.2210   |           | 85           | 0.0100  | 0.0317             | 0.211       | 6 665        | 3.149               |
| 17 SODIUM    | G26891089003  | 10/24/89    | B203189  | 714.0000 |           | 101          | 65 7116 | 104.2265           | 648 288     | 6.220        | 3.207               |
| 18 STRONTIUM | G26891089003  | 10/24/89    | B203189  | 7.1200   |           | 101          | 0.5699  | 0 7232             | 6.550       | 9 057        | 3 207               |
| 19 ZINC      | G34890689001  | 06/16/89    | B203989  | 0.3740   | V         | 88           | 0 0282  | 0 0439             | 0 346       | 7 871        | 3.160               |

U=Analyzed but not detected      J=Present below detection limit      E=Estimated value  
A=Acceptable with qualifications      V=Valid and acceptable      R=Rejected

ASTM Outlier Tests of Inorganic Concentrations in Ground Water  
(Concentration units mg/l except pH)

| Analyte                  | Sample Number | Sample Date | Location | Outlier | Qualifier | Total Values | Mean     | Standard Deviation | Difference Result-Mean | Outlier Test Statistic | ASTM Critical Value |
|--------------------------|---------------|-------------|----------|---------|-----------|--------------|----------|--------------------|------------------------|------------------------|---------------------|
| 1 CARBONATE              | G37890889002  | 08/22/89    | 8304289  | 25      | A         | 98           | 3.2388   | 3.0397             | 21.761                 | 7.159                  | 3.196               |
| 2 CHLORIDE               | G41890889002  | 08/23/89    | 8304989  | 260     | V         | 99           | 21.7119  | 44.8400            | 238.288                | 5.314                  | 3.200               |
| 3 HYDROGEN CARBONATE     | G46891089003  | 10/25/89    | 8205589  | 680     | A         | 99           | 219.9879 | 131.7475           | 460.012                | 3.492                  | 3.200               |
| 4 NITRATE/NITRITE        | G11890789002  | 07/28/89    | 8201289  | 6.5     | V         | 96           | 0.9068   | 1.0760             | 5.593                  | 5.198                  | 3.189               |
| 5 SULFATE                | G26891089003  | 11/02/89    | 8303089  | 1800    | V         | 99           | 75.1646  | 208.3977           | 1724.835               | 8.277                  | 3.200               |
| 6 TOTAL DISSOLVED SOLIDS | G26891089003  | 11/02/89    | 8303089  | 3300    | A         | 98           | 381.4388 | 450.3032           | 2918.561               | 6.481                  | 3.196               |

U=Analyzed but not detected J=Present below detection limit E=Estimated value  
A=Acceptable with qualifications V=Valid and acceptable R=Rejected

ASTM Outlier Tests of Dissolved Radiochemical Concentrations in Ground Water  
(Concentration units pCi/l)

| Analyte         | Sample Number  | Sample Date | Location | Outlier | Qualifier | Total Values | Mean   | Standard Deviation | Difference Result-Mean | Outlier Test Statistic | ASTM Critical Value |
|-----------------|----------------|-------------|----------|---------|-----------|--------------|--------|--------------------|------------------------|------------------------|---------------------|
| 1 AMERICIUM-241 | G35890889002_1 | 08/31/89    | B204089  | 0.082   |           | 77           | 0.0027 | 0.0117             | 0.079                  | 6.756                  | 3.117               |
| 2 GROSS ALPHA   | G46890789002   | 07/21/89    | B205589  | 200     |           | 96           | 7.0948 | 21.2486            | 192.905                | 9.078                  | 3.189               |
| 3 GROSS BETA    | G46890789002   | 07/21/89    | B205589  | 220     |           | 97           | 8.2629 | 22.9737            | 211.737                | 9.217                  | 3.193               |
| 4 PLUTONIUM-239 | G19890789002   | 07/14/89    | B102389  | 0.03    |           | 90           | 0.0027 | 0.0056             | 0.027                  | 4.861                  | 3.168               |
| 5 RADIUM 226    | G06890789002   | 07/27/89    | B200689  | 170     |           | 24           | 7.5465 | 34.6066            | 162.454                | 4.694                  | 2.642               |
| 6 STRONTIUM-90  | G08891089003   | 10/05/89    | B200889  | 2.13    |           | 97           | 0.1420 | 0.3648             | 1.988                  | 5.450                  | 3.193               |
| 7 URANIUM-235   | G46891089003   | 10/25/89    | B205589  | 7.74    |           | 99           | 0.1987 | 0.8392             | 7.541                  | 8.987                  | 3.200               |
| 8 URANIUM-238   | G46891089003   | 10/25/89    | B205589  | 76.9    |           | 99           | 2.6111 | 9.9635             | 74.289                 | 7.456                  | 3.200               |

U=Analyzed but not detected J=Present below detection limit E=Estimated value  
A=Acceptable with qualifications V=Valid and acceptable R=Rejected

ASTM Outlier Tests of Field Concentrations in Ground Water  
(Concentration units appropriate units)

| Analyte        | Sample<br>Number | Sample<br>Date | Location | Outlier | Qualifier | Total | Mean     | Standard<br>Deviation | Difference<br>Result-Mean | Outlier<br>Test<br>Statistic | ASTM<br>Critical<br>Value |
|----------------|------------------|----------------|----------|---------|-----------|-------|----------|-----------------------|---------------------------|------------------------------|---------------------------|
| 1 CONDUCTIVITY | G26891089003     | 10/24/89       | B203189  | 4100    |           | 117   | 496 7265 | 499.9277              | 3603.274                  | 7 208                        | 3 260                     |
| 2 PH_FIELD     | G36890689001     | 06/27/89       | B204189  | 10.4    |           | 117   | 7 5761   | 0.8140                | 2 824                     | 3.469                        | 3.260                     |
| 3 TEMPERATURE  | G26890689001     | 06/30/89       | B303089  | 25      |           | 117   | 13 9752  | 2.9502                | 11 025                    | 3 737                        | 3.260                     |

U=Analyzed but not detected J=Present below detection limit E=Estimated value  
A=Acceptable with qualifications V=Valid and acceptable R=Rejected

ASTM Outlier Tests of Total Metal Concentrations in Borehole  
(Concentration units mg/kg)

| Analyte       | Sample Number | Sample Date | Location | Outlier     | Qualifier | Total Values | Mean       | Standard Deviation | Difference Result-Mean | Outlier Test Statistic | ASTM Critical Value |
|---------------|---------------|-------------|----------|-------------|-----------|--------------|------------|--------------------|------------------------|------------------------|---------------------|
|               |               |             |          |             |           |              |            |                    |                        |                        |                     |
| 1 ALUMINUM    | BH09890104    | 03/02/89    | B200989  | 40800 0000  | E         | 123          | 10610.1951 | 6327.0869          | 30189 805              | 4.772                  | 3 279               |
| 2 ANTIMONY    | BH17891319    | 03/28/89    | B302089  | 16.2000     | A         | 86           | 6 9198     | 1 4634             | 9.280                  | 6 341                  | 3 153               |
| 3 ARSENIC     | BH06890104    | 02/28/89    | B200689  | 41.7000     | A         | 123          | 3 5358     | 4.1605             | 38 164                 | 9.173                  | 3.279               |
| 4 BARIUM      | BH16890003    | 04/05/89    | B401989  | 491 0000    |           | 123          | 82.5919    | 62.6392            | 408 408                | 6.520                  | 3.279               |
| 5 BERYLLIUM   | BH07890103    | 03/01/89    | B200789  | 19 0000     |           | 123          | 3 6142     | 3 1235             | 15 386                 | 4 926                  | 3 279               |
| 6 CADMIUM     | BH05890003    | 02/22/89    | B200589  | 3.2000      |           | 95           | 0 6567     | 0 3562             | 2.543                  | 7 139                  | 3.186               |
| 7 CALCIUM     | BH07890306    | 03/01/89    | B200789  | 157000.0000 |           | 123          | 6365.9431  | 14752 4646         | 150634 057             | 10 211                 | 3 279               |
| 8 CHROMIUM    | BH06890410    | 02/28/89    | B200689  | 69 6000     | V         | 123          | 14.6902    | 9 3119             | 54 910                 | 5.897                  | 3 279               |
| 9 COBALT      | BH12892930    | 03/22/89    | B201289  | 29 7000     | A         | 123          | 7.5280     | 4 3905             | 22 172                 | 5.050                  | 3 279               |
| 10 COPPER     | BH03890003    | 04/25/89    | B400389  | 31 6000     | V         | 122          | 11.0668    | 5 4633             | 20 533                 | 3.758                  | 3.276               |
| 11 IRON       | BH17891319    | 03/28/89    | B302089  | 38100 0000  | V         | 122          | 12599 7541 | 5722 3773          | 25500 246              | 4 456                  | 3 276               |
| 12 LITHIUM    | BH09890104    | 03/02/89    | B200989  | 31 3000     | V         | 123          | 8 7039     | 4 0185             | 22 596                 | 5 623                  | 3.279               |
| 13 MANGANESE  | BH18890713    | 03/29/89    | B402189  | 737.0000    |           | 123          | 168 5398   | 128.0536           | 568 460                | 4.439                  | 3 279               |
| 14 MERCURY    | BH04894652    | 05/01/89    | B400489  | 0 5800      | V         | 108          | 0 1193     | 0 1041             | 0.461                  | 4.425                  | 3 231               |
| 15 MOLYBDENUM | BH07890103    | 03/01/89    | B200789  | 41.0000     |           | 123          | 10.1914    | 6 3886             | 30 809                 | 4.822                  | 3 279               |
| 16 NICKEL     | BH12892930    | 03/22/89    | B201289  | 62.4000     | A         | 117          | 18.3406    | 11.2390            | 44 059                 | 3 920                  | 3.260               |
| 17 POTASSIUM  | BH04893538    | 05/01/89    | B400489  | 4020 0000   | A         | 122          | 1120.0656  | 779.0193           | 2899 934               | 3 723                  | 3 276               |
| 18 SILVER     | BH06890003    | 03/09/89    | B200689  | 40.9000     |           | 105          | 4.9930     | 8 6136             | 35.907                 | 4 169                  | 3.220               |
| 19 SODIUM     | BH17890003    | 03/28/89    | B302089  | 3680 0000   |           | 123          | 594 5203   | 292.2006           | 3085.480               | 10.559                 | 3.279               |
| 20 STRONTIUM  | BH07890306    | 03/01/89    | B200789  | 226.0000    | V         | 123          | 53.9289    | 45.4516            | 172 071                | 3 786                  | 3.279               |
| 21 THALLIUM   | BH10890003    | 03/09/89    | B201089  | 2 3000      | A         | 99           | 1.1471     | 0 2210             | 1.153                  | 5 218                  | 3.200               |
| 22 TIN        | BH14890003    | 03/15/89    | B201589  | 441.0000    |           | 111          | 59.3198    | 106.6662           | 381 680                | 3 578                  | 3 241               |
| 23 ZINC       | BH178913190   | 03/28/89    | B302089  | 133.0000    | V         | 121          | 35.0616    | 24.6868            | 97 938                 | 3.967                  | 3 273               |

U=Analyzed but not detected    J=Present below detection limit    E=Estimated value  
A=Acceptable with qualifications    V=Valid and acceptable    R=Rejected

ASTM Outlier Tests of Inorganic Concentrations in Borehole  
(Concentration units mg/kg except pH)

| <u>Analyte</u>    | <u>Sample Number</u> | <u>Sample Date</u> | <u>Location</u> | <u>Outlier</u> | <u>Qualifier</u> | <u>Total Values</u> | <u>Mean</u> | <u>Standard Deviation</u> | <u>Difference Result-Mean</u> | <u>Outlier Test Statistic</u> | <u>ASTM Critical Value</u> |
|-------------------|----------------------|--------------------|-----------------|----------------|------------------|---------------------|-------------|---------------------------|-------------------------------|-------------------------------|----------------------------|
|                   |                      |                    |                 |                |                  |                     |             |                           |                               |                               |                            |
| 1 NITRATE/NITRITE | BH08890003           | 03/08/89           | B200889         | 4.3            | V                | 115                 | 1 0600      | 0.8323                    | 3.240                         | 3 893                         | 3.254                      |

U=Analyzed but not detected J=Present below detection limit E=Estimated value  
A=Acceptable with qualifications V=Valid and acceptable R=Rejected

ASTM Outlier Tests of Total Radiochemical Concentrations in Borehole  
(Concentration units pCi/g except Tritium units pCi/ml)

| Analyte             | Sample<br>Number | Sample<br>Date | Location | Outlier | Qualifier | Total<br>Values | Mean    | Standard<br>Deviation | Difference<br>Result-Mean | Outlier<br>Test<br>Statistic | ASTM<br>Critical<br>Value |
|---------------------|------------------|----------------|----------|---------|-----------|-----------------|---------|-----------------------|---------------------------|------------------------------|---------------------------|
| 1 CESIUM-137        | BH02890003       | 04/12/89       | B400289  | 0.2000  |           | 118             | 0 0068  | 0.0313                | 0.193                     | 6.174                        | 3 263                     |
| 2 GROSS BETA        | BH05891317       | 02/22/89       | B200589  | 44.0000 |           | 118             | 24 7542 | 5 6914                | 19.246                    | 3 382                        | 3 263                     |
| 3 STRONTIUM-90      | BH03893339       | 04/25/89       | B400389  | 1.2000  |           | 118             | -0 0161 | 0 3569                | 1.216                     | 3.408                        | 3.263                     |
| 4 URANIUM, TOTAL    | BH09890410       | 03/02/89       | B200989  | 6 7000  |           | 118             | 1 5314  | 0 7998                | 5.169                     | 6 463                        | 3 263                     |
| 5 URANIUM-233, -234 | BH09890410       | 03/02/89       | B200989  | 3.4000  |           | 118             | 0 7305  | 0.4195                | 2.669                     | 6 363                        | 3.263                     |
| 6 URANIUM-235       | BH10890713       | 03/02/89       | B201089  | 0.3000  |           | 118             | 0 0246  | 0.0522                | 0.275                     | 5.277                        | 3.263                     |
| 7 URANIUM-238       | BH09890410       | 03/02/89       | B200989  | 3 2000  |           | 118             | 0 7763  | 0 3865                | 2.424                     | 6.272                        | 3 263                     |

U=Analyzed but not detected J=Present below detection limit E=Estimated value  
A=Acceptable with qualifications V=Valid and acceptable R=Rejected

## **APPENDIX D**

### **DATA VALIDATION SUMMARY**

DATA VALIDATION SUMMARY  
SEDIMENTS  
TOTAL METALS

| Analyte                | Number of Results | Number Reviewed | Percent Reviewed | Number Valid | Percent Valid | Number Acceptable | Percent Acceptable | Number Rejected | Percent Rejected |
|------------------------|-------------------|-----------------|------------------|--------------|---------------|-------------------|--------------------|-----------------|------------------|
| Aluminum (Al), total   | 20                | 15              | 75               | 15           | 100           | 0                 | 0                  | 0               | 0                |
| Antimony (Sb), total   | 20                | 15              | 75               | 0            | 0             | 14                | 93                 | 1               | 7                |
| Arsenic (As), total    | 20                | 15              | 75               | 0            | 0             | 15                | 100                | 0               | 0                |
| Barium (Ba), total     | 20                | 15              | 75               | 6            | 40            | 7                 | 47                 | 2               | 13               |
| Beryllium (Be), total  | 20                | 15              | 75               | 14           | 93            | 1                 | 7                  | 0               | 0                |
| Cadmium (Cd), total    | 20                | 15              | 75               | 10           | 67            | 0                 | 0                  | 5               | 33               |
| Calcium (Ca), total    | 20                | 15              | 75               | 7            | 47            | 8                 | 53                 | 0               | 0                |
| Cesium (Cs), total     | 20                | 15              | 75               | 14           | 93            | 1                 | 7                  | 0               | 0                |
| Chromium (Cr), total   | 20                | 15              | 75               | 9            | 60            | 6                 | 40                 | 0               | 0                |
| Cobalt (Co), total     | 20                | 15              | 75               | 2            | 13            | 13                | 87                 | 0               | 0                |
| Copper (Cu), total     | 20                | 15              | 75               | 5            | 33            | 10                | 67                 | 0               | 0                |
| Iron (Fe), total       | 20                | 15              | 75               | 15           | 100           | 0                 | 0                  | 0               | 0                |
| Lead (Pb), total       | 20                | 15              | 75               | 10           | 67            | 5                 | 33                 | 0               | 0                |
| Lithium (Li), total    | 20                | 15              | 75               | 10           | 67            | 5                 | 33                 | 0               | 0                |
| Magnesium (Mg), total  | 20                | 15              | 75               | 8            | 53            | 7                 | 47                 | 0               | 0                |
| Manganese (Mn), total  | 20                | 15              | 75               | 15           | 100           | 0                 | 0                  | 0               | 0                |
| Mercury (Hg), total    | 20                | 15              | 75               | 1            | 7             | 9                 | 60                 | 5               | 33               |
| Molybdenum (Mo), total | 20                | 15              | 75               | 15           | 100           | 0                 | 0                  | 0               | 0                |
| Nickel (Ni), total     | 20                | 15              | 75               | 5            | 33            | 9                 | 60                 | 1               | 7                |
| Potassium (K), total   | 20                | 15              | 75               | 1            | 7             | 14                | 93                 | 0               | 0                |
| Selenium (Se), total   | 20                | 15              | 75               | 6            | 40            | 14                | 93                 | 0               | 0                |
| Silver (Ag), total     | 20                | 15              | 75               | 10           | 67            | 5                 | 33                 | 4               | 27               |
| Sodium (Na), total     | 20                | 15              | 75               | 10           | 67            | 5                 | 33                 | 0               | 0                |
| Strontium (Sr), total  | 20                | 15              | 75               | 10           | 67            | 5                 | 33                 | 0               | 0                |
| Thallium (Tl), total   | 20                | 15              | 75               | 5            | 33            | 2                 | 13                 | 8               | 53               |
| Tin (Sn), total        | 20                | 15              | 75               | 15           | 100           | 0                 | 0                  | 0               | 0                |
| Vanadium (V), total    | 20                | 15              | 75               | 7            | 47            | 6                 | 40                 | 2               | 13               |
| Zinc (Zn), total       | 20                | 15              | 75               | 3            | 20            | 12                | 80                 | 0               | 0                |

Reviewed = Validation review conducted

GROUND WATER  
DISSOLVED METALS  
DATA VALIDATION SUMMARY

| Analyte                | Number of Results | Number Reviewed | Percent Reviewed | Number Valid | Percent Valid | Number Acceptable | Percent Acceptable | Number Rejected | Percent Rejected |
|------------------------|-------------------|-----------------|------------------|--------------|---------------|-------------------|--------------------|-----------------|------------------|
| Aluminum (Al), total   | 123               | 104             | 85               | 34           | 33            | 38                | 37                 | 32              | 31               |
| Antimony (Sb), total   | 123               | 104             | 85               | 62           | 60            | 35                | 34                 | 7               | 7                |
| Arsenic (As), total    | 122               | 104             | 85               | 63           | 61            | 25                | 24                 | 16              | 15               |
| Barium (Ba), total     | 123               | 104             | 85               | 92           | 88            | 10                | 10                 | 2               | 2                |
| Beryllium (Be), total  | 123               | 104             | 85               | 50           | 48            | 32                | 31                 | 22              | 21               |
| Cadmium (Cd), total    | 123               | 104             | 85               | 65           | 63            | 20                | 19                 | 19              | 18               |
| Calcium (Ca), total    | 123               | 104             | 85               | 92           | 88            | 12                | 12                 | 0               | 0                |
| Cesium (Cs), total     | 122               | 104             | 85               | 89           | 86            | 1                 | 1                  | 14              | 13               |
| Chromium (Cr), total   | 123               | 104             | 85               | 71           | 68            | 22                | 21                 | 11              | 11               |
| Cobalt (Co), total     | 123               | 104             | 85               | 94           | 90            | 2                 | 2                  | 8               | 8                |
| Copper (Cu), total     | 123               | 104             | 85               | 46           | 44            | 39                | 38                 | 19              | 18               |
| Iron (Fe), total       | 123               | 104             | 85               | 41           | 39            | 51                | 49                 | 12              | 12               |
| Lead (Pb), total       | 122               | 104             | 85               | 22           | 21            | 71                | 68                 | 11              | 11               |
| Lithium (Li), total    | 121               | 104             | 86               | 72           | 69            | 28                | 27                 | 4               | 4                |
| Magnesium (Mg), total  | 123               | 104             | 85               | 100          | 96            | 4                 | 4                  | 0               | 0                |
| Manganese (Mn), total  | 123               | 104             | 85               | 69           | 66            | 32                | 31                 | 3               | 3                |
| Mercury (Hg), total    | 122               | 104             | 85               | 75           | 72            | 13                | 13                 | 16              | 15               |
| Molybdenum (Mo), total | 123               | 104             | 85               | 70           | 67            | 34                | 33                 | 0               | 0                |
| Nickel (Ni), total     | 123               | 104             | 85               | 59           | 57            | 25                | 24                 | 20              | 19               |
| Potassium (K), total   | 122               | 104             | 85               | 21           | 20            | 67                | 64                 | 16              | 15               |
| Selenium (Se), total   | 122               | 104             | 85               | 33           | 32            | 46                | 44                 | 25              | 24               |
| Silver (Ag), total     | 123               | 104             | 85               | 47           | 45            | 42                | 40                 | 15              | 14               |
| Sodium (Na), total     | 123               | 102             | 83               | 92           | 90            | 10                | 10                 | 0               | 0                |
| Strontium (Sr), total  | 123               | 102             | 83               | 63           | 62            | 37                | 36                 | 2               | 2                |
| Thallium (Tl), total   | 121               | 104             | 85               | 46           | 44            | 52                | 50                 | 6               | 6                |
| Tin (Sn), total        | 121               | 104             | 86               | 68           | 65            | 36                | 35                 | 0               | 0                |
| Vanadium (V), total    | 123               | 104             | 85               | 81           | 78            | 12                | 12                 | 11              | 11               |
| Zinc (Zn), total       | 123               | 104             | 85               | 19           | 18            | 73                | 70                 | 12              | 12               |

Reviewed = Validation review conducted

GROUND WATER  
TOTAL OTHER INORGANICS  
DATA VALIDATION SUMMARY

| Analyte                | Number of Results | Number Reviewed | Percent Reviewed | Number Valid | Percent Valid | Number Acceptable | Percent Acceptable | Number Rejected | Percent Rejected |
|------------------------|-------------------|-----------------|------------------|--------------|---------------|-------------------|--------------------|-----------------|------------------|
| Nitrate-Nitrite as N   | 120               | 105             | 88               | 77           | 73            | 25                | 24                 | 3               | 3                |
| Chloride               | 121               | 108             | 89               | 87           | 81            | 21                | 19                 | 0               | 0                |
| Sulfate                | 121               | 109             | 90               | 68           | 62            | 41                | 38                 | 0               | 0                |
| Total Dissolved Solids | 120               | 109             | 91               | 25           | 23            | 84                | 77                 | 0               | 0                |
| HCO3-                  | 121               | 109             | 90               | 68           | 62            | 41                | 38                 | 0               | 0                |
| CO3=                   | 119               | 108             | 91               | 67           | 62            | 41                | 38                 | 0               | 0                |
| pH                     | 119               | 0               | 0                | 0            | ****          | 0                 | ****               | 0               | ****             |
| Cyanide, total         |                   | 116             | 76               | 66           | 62            | 82                | 14                 | 18              | 0                |

Reviewed = Validation review conducted

SURFACE WATER  
DISSOLVED METALS  
DATA VALIDATION SUMMARY

| Analyte                | Number of Results | Number Reviewed | Percent Reviewed | Number Valid | Percent Valid | Number Acceptable | Percent Acceptable | Number Rejected | Percent Rejected |
|------------------------|-------------------|-----------------|------------------|--------------|---------------|-------------------|--------------------|-----------------|------------------|
| Aluminum (Al), total   | 64                | 48              | 75               | 23           | 48            | 13                | 27                 | 12              | 25               |
| Antimony (Sb), total   | 64                | 48              | 75               | 31           | 65            | 8                 | 17                 | 9               | 19               |
| Arsenic (As), total    | 64                | 48              | 75               | 26           | 54            | 13                | 27                 | 9               | 19               |
| Barium (Ba), total     | 64                | 48              | 75               | 41           | 85            | 6                 | 13                 | 1               | 2                |
| Beryllium (Be), total  | 64                | 48              | 75               | 23           | 48            | 14                | 29                 | 11              | 23               |
| Cadmium (Cd), total    | 64                | 48              | 75               | 26           | 54            | 11                | 23                 | 11              | 23               |
| Calcium (Ca), total    | 64                | 48              | 75               | 42           | 88            | 6                 | 13                 | 0               | 0                |
| Cesium (Cs), total     | 64                | 48              | 75               | 42           | 88            | 4                 | 8                  | 2               | 4                |
| Chromium (Cr), total   | 64                | 48              | 75               | 25           | 52            | 9                 | 19                 | 14              | 29               |
| Cobalt (Co), total     | 64                | 48              | 75               | 41           | 85            | 0                 | 0                  | 7               | 15               |
| Copper (Cu), total     | 64                | 48              | 75               | 37           | 77            | 9                 | 19                 | 2               | 4                |
| Iron (Fe), total       | 64                | 48              | 75               | 30           | 63            | 16                | 33                 | 2               | 4                |
| Lead (Pb), total       | 64                | 48              | 75               | 8            | 17            | 33                | 69                 | 7               | 15               |
| Lithium (Li), total    | 64                | 48              | 75               | 37           | 77            | 10                | 21                 | 1               | 2                |
| Magnesium (Mg), total  | 64                | 48              | 75               | 44           | 92            | 4                 | 8                  | 0               | 0                |
| Manganese (Mn), total  | 64                | 48              | 75               | 31           | 65            | 13                | 27                 | 4               | 8                |
| Mercury (Hg), total    | 64                | 48              | 75               | 29           | 60            | 9                 | 19                 | 10              | 21               |
| Molybdenum (Mo), total | 64                | 48              | 75               | 30           | 63            | 16                | 33                 | 2               | 4                |
| Nickel (Ni), total     | 64                | 48              | 75               | 20           | 42            | 13                | 27                 | 15              | 31               |
| Potassium (K), total   | 64                | 48              | 75               | 12           | 25            | 24                | 50                 | 12              | 25               |
| Selenium (Se), total   | 64                | 48              | 75               | 12           | 25            | 20                | 42                 | 16              | 33               |
| Silver (Ag), total     | 64                | 48              | 75               | 26           | 54            | 20                | 42                 | 2               | 4                |
| Sodium (Na), total     | 64                | 48              | 75               | 44           | 92            | 4                 | 8                  | 0               | 0                |
| Strontium (Sr), total  | 64                | 45              | 70               | 25           | 56            | 19                | 42                 | 1               | 2                |
| Thallium (Tl), total   | 64                | 48              | 75               | 26           | 54            | 20                | 42                 | 2               | 4                |
| Tin (Sn), total        | 64                | 48              | 75               | 32           | 67            | 16                | 33                 | 0               | 0                |
| Vanadium (V), total    | 64                | 48              | 75               | 38           | 79            | 8                 | 17                 | 2               | 4                |
| Zinc (Zn), total       | 64                | 48              | 75               | 14           | 29            | 27                | 56                 | 7               | 15               |

Reviewed = Validation review conducted

SURFACE WATER  
TOTAL METALS  
DATA VALIDATION SUMMARY

| Analyte    | Number of Results | Number Reviewed | Percent Reviewed | Number Valid | Percent Valid | Number Acceptable | Percent Acceptable | Number Rejected | Percent Rejected |
|------------|-------------------|-----------------|------------------|--------------|---------------|-------------------|--------------------|-----------------|------------------|
| Aluminum   | 65                | 48              | 74               | 28           | 58            | 14                | 29                 | 6               | 13               |
| Antimony   | 65                | 49              | 75               | 29           | 59            | 8                 | 16                 | 12              | 24               |
| Arsenic    | 65                | 49              | 75               | 29           | 59            | 13                | 27                 | 7               | 14               |
| Barium     | 65                | 49              | 75               | 44           | 90            | 5                 | 10                 | 0               | 0                |
| Beryllium  | 65                | 49              | 75               | 23           | 47            | 19                | 39                 | 7               | 14               |
| Cadmium    | 65                | 49              | 75               | 28           | 57            | 11                | 22                 | 10              | 20               |
| Calcium    | 65                | 48              | 74               | 42           | 88            | 6                 | 13                 | 0               | 0                |
| Cesium     | 65                | 49              | 75               | 45           | 92            | 3                 | 6                  | 1               | 2                |
| Chromium   | 65                | 49              | 75               | 24           | 49            | 15                | 31                 | 10              | 20               |
| Cobalt     | 65                | 49              | 75               | 39           | 80            | 4                 | 8                  | 6               | 12               |
| Copper     | 65                | 49              | 75               | 37           | 76            | 11                | 22                 | 1               | 2                |
| Iron       | 65                | 48              | 74               | 40           | 83            | 8                 | 17                 | 0               | 0                |
| Lead       | 65                | 49              | 75               | 14           | 29            | 32                | 65                 | 3               | 6                |
| Lithium    | 65                | 49              | 75               | 36           | 73            | 12                | 24                 | 1               | 2                |
| Magnesium  | 65                | 49              | 75               | 45           | 92            | 4                 | 8                  | 0               | 0                |
| Manganese  | 65                | 49              | 75               | 33           | 67            | 15                | 31                 | 1               | 2                |
| Mercury    | 64                | 48              | 75               | 24           | 50            | 13                | 27                 | 11              | 23               |
| Molybdenum | 65                | 49              | 75               | 29           | 59            | 20                | 41                 | 0               | 0                |
| Nickel     | 65                | 49              | 75               | 22           | 45            | 12                | 24                 | 15              | 31               |
| Potassium  | 65                | 49              | 75               | 12           | 24            | 28                | 57                 | 9               | 18               |
| Selenium   | 65                | 49              | 75               | 9            | 18            | 30                | 61                 | 10              | 20               |
| Silver     | 65                | 49              | 75               | 26           | 53            | 19                | 39                 | 4               | 8                |
| Sodium     | 65                | 49              | 75               | 44           | 90            | 5                 | 10                 | 0               | 0                |
| Strontium  | 65                | 46              | 71               | 24           | 52            | 21                | 46                 | 1               | 2                |
| Thallium   | 65                | 49              | 75               | 24           | 49            | 22                | 45                 | 3               | 6                |
| Tin        | 65                | 49              | 75               | 30           | 61            | 19                | 39                 | 0               | 0                |
| Vanadium   | 65                | 49              | 75               | 36           | 73            | 12                | 24                 | 1               | 2                |
| Zinc       | 65                | 49              | 75               | 25           | 51            | 21                | 43                 | 3               | 6                |

Reviewed = Validation review conducted

SURFACE WATER  
TOTAL OTHER INORGANICS  
DATA VALIDATION SUMMARY

| Analyte                       | Number of Results | Number Reviewed | Percent Reviewed | Number Valid | Percent Valid | Number Acceptable | Percent Acceptable | Number Rejected | Percent Rejected |
|-------------------------------|-------------------|-----------------|------------------|--------------|---------------|-------------------|--------------------|-----------------|------------------|
| Nitrate-Nitrite as N          | 61                | 57              | 93               | 42           | 74            | 15                | 26                 | 0               | 0                |
| Chloride                      | 61                | 56              | 92               | 36           | 64            | 20                | 36                 | 0               | 0                |
| Sulfate                       | 61                | 57              | 93               | 26           | 46            | 31                | 54                 | 0               | 0                |
| Total Dissolved Solids        | 61                | 57              | 93               | 23           | 40            | 34                | 60                 | 0               | 0                |
| HCO <sub>3</sub> <sup>-</sup> | 61                | 57              | 93               | 51           | 89            | 6                 | 11                 | 0               | 0                |
| CO <sub>3</sub> <sup>=</sup>  | 61                | 57              | 93               | 51           | 89            | 6                 | 11                 | 0               | 0                |
| pH                            | 61                | 0               | 0                | 0            | ****          | 0                 | ****               | 0               | ****             |
| Cyanide, total                |                   | 60              | 33               | 55           | 28            | 85                | 1                  | 3               | 12               |

Reviewed = Validation review conducted

SEDIMENTS  
OTHER INORGANICS  
DATA VALIDATION SUMMARY

| Analyte              | Number of<br>Results | Number<br>Reviewed | Percent<br>Reviewed | Number<br>Valid | Percent<br>Valid | Number<br>Acceptable | Percent<br>Acceptable | Number<br>Rejected | Percent<br>Rejected |
|----------------------|----------------------|--------------------|---------------------|-----------------|------------------|----------------------|-----------------------|--------------------|---------------------|
| Nitrate-Nitrite as N | 20                   | 17                 | 85                  | 17              | 100              | 0                    | 0                     | 0                  | 0                   |
| pH                   | 20                   | 4                  | 20                  | 4               | 100              | 0                    | 0                     | 0                  | 0                   |
| Sulfide              | 0                    | 0                  | ***                 | 0               | ***              | 0                    | ***                   | 0                  | ***                 |

Reviewed = Validation review conducted

SOILS  
TOTAL METALS  
DATA VALIDATION SUMMARY

| Analyte    | Number of Results | Number Reviewed | Percent Reviewed | Number Valid | Percent Valid | Number Acceptable | Percent Acceptable | Number Rejected | Percent Rejected |
|------------|-------------------|-----------------|------------------|--------------|---------------|-------------------|--------------------|-----------------|------------------|
| Aluminum   | 131               | 123             | 94               | 86           | 70            | 37                | 30                 | 0               | 0                |
| Antimony   | 131               | 128             | 98               | 5            | 4             | 72                | 56                 | 51              | 40               |
| Arsenic    | 131               | 128             | 98               | 34           | 27            | 94                | 73                 | 0               | 0                |
| Barium     | 131               | 128             | 98               | 96           | 75            | 32                | 25                 | 0               | 0                |
| Beryllium  | 131               | 128             | 98               | 67           | 52            | 61                | 48                 | 0               | 0                |
| Cadmium    | 131               | 128             | 98               | 56           | 44            | 43                | 34                 | 29              | 23               |
| Calcium    | 131               | 127             | 97               | 88           | 69            | 39                | 31                 | 0               | 0                |
| Cesium     | 131               | 128             | 98               | 99           | 77            | 17                | 13                 | 12              | 9                |
| Chromium   | 131               | 128             | 98               | 73           | 57            | 55                | 43                 | 0               | 0                |
| Cobalt     | 131               | 128             | 98               | 101          | 79            | 27                | 21                 | 0               | 0                |
| Copper     | 131               | 128             | 98               | 60           | 47            | 67                | 52                 | 1               | 1                |
| Iron       | 131               | 119             | 91               | 103          | 87            | 15                | 13                 | 1               | 1                |
| Lead       | 131               | 128             | 98               | 84           | 66            | 44                | 34                 | 0               | 0                |
| Lithium    | 131               | 128             | 98               | 117          | 91            | 11                | 9                  | 0               | 0                |
| Magnesium  | 131               | 128             | 98               | 93           | 73            | 35                | 27                 | 0               | 0                |
| Manganese  | 131               | 122             | 93               | 40           | 33            | 82                | 67                 | 0               | 0                |
| Mercury    | 131               | 128             | 98               | 65           | 51            | 41                | 32                 | 22              | 17               |
| Molybdenum | 131               | 128             | 98               | 89           | 70            | 39                | 30                 | 0               | 0                |
| Nickel     | 131               | 128             | 98               | 23           | 18            | 99                | 77                 | 6               | 5                |
| Potassium  | 131               | 128             | 98               | 62           | 48            | 65                | 51                 | 1               | 1                |
| Selenium   | 131               | 126             | 96               | 6            | 5             | 89                | 71                 | 31              | 25               |
| Silver     | 131               | 128             | 98               | 51           | 40            | 56                | 44                 | 21              | 16               |
| Sodium     | 131               | 128             | 98               | 107          | 84            | 21                | 16                 | 0               | 0                |
| Strontium  | 131               | 128             | 98               | 111          | 87            | 17                | 13                 | 0               | 0                |
| Thallium   | 131               | 128             | 98               | 30           | 23            | 65                | 51                 | 33              | 26               |
| Tin        | 131               | 128             | 98               | 99           | 77            | 15                | 12                 | 14              | 11               |
| Vanadium   | 131               | 128             | 98               | 92           | 72            | 35                | 27                 | 1               | 1                |
| Zinc       | 131               | 128             | 98               | 57           | 45            | 69                | 54                 | 2               | 2                |

Reviewed = Validation review conducted

SOILS  
OTHER INORGANICS  
DATA VALIDATION SUMMARY

| Analyte              | Number of<br>Results | Number<br>Reviewed | Percent<br>Reviewed | Number<br>Valid | Percent<br>Valid | Number<br>Acceptable | Percent<br>Acceptable | Number<br>Rejected | Percent<br>Rejected |
|----------------------|----------------------|--------------------|---------------------|-----------------|------------------|----------------------|-----------------------|--------------------|---------------------|
| Nitrate-Nitrite as N | 131                  | 122                | 93                  | 94              | 77               | 28                   | 23                    | 0                  | 0                   |
| pH                   | 131                  | 1                  | 1                   | 1               | 100              | 0                    | 0                     | 0                  | 0                   |
| Sulfide              | 130                  | 123                | 95                  | 112             | 91               | 0                    | 0                     | 11                 | 9                   |

Reviewed = Validation review conducted

**SOILS**  
**TOTAL RADIONUCLIDES**  
**DATA VALIDATION SUMMARY**

| Analyte            | Number of Results | Number Reviewed | Percent Reviewed | Number Valid | Percent Valid | Number Acceptable | Percent Acceptable | Number Rejected | Percent Rejected |
|--------------------|-------------------|-----------------|------------------|--------------|---------------|-------------------|--------------------|-----------------|------------------|
| Gross Alpha        | 131               | 0               | 0                | 0            | ****          | 0                 | ****               | 0               | ****             |
| Gross Beta         | 131               | 0               | 0                | 0            | ****          | 0                 | ****               | 0               | ****             |
| Uranium 233, 234   | 131               | 0               | 0                | 0            | ****          | 0                 | ****               | 0               | ****             |
| Uranium 235        | 131               | 0               | 0                | 0            | ****          | 0                 | ****               | 0               | ****             |
| Uranium 238        | 131               | 0               | 0                | 0            | ****          | 0                 | ****               | 0               | ****             |
| Strontium 89, 90   | 131               | 0               | 0                | 0            | ****          | 0                 | ****               | 0               | ****             |
| Plutonium 239, 240 | 131               | 0               | 0                | 0            | ****          | 0                 | ****               | 0               | ****             |
| Americium 241      | 83                | 0               | 0                | 0            | ****          | 0                 | ****               | 0               | ****             |
| Cesium 137         | 131               | 0               | 0                | 0            | ****          | 0                 | ****               | 0               | ****             |
| Tritium            | 131               | 0               | 0                | 0            | ****          | 0                 | ****               | 0               | ****             |
| Radium 226         | 122               | 0               | 0                | 0            | ****          | 0                 | ****               | 0               | ****             |
| Radium 228         | 122               | 0               | 0                | 0            | ****          | 0                 | ****               | 0               | ****             |

Reviewed = Validation review conducted

SEDIMENTS  
TOTAL RADIONUCLIDES  
DATA VALIDATION SUMMARY

| Analyte            | Number of<br>Results | Number<br>Reviewed | Percent<br>Reviewed | Number<br>Valid | Percent<br>Valid | Number<br>Acceptable | Percent<br>Acceptable | Number<br>Rejected | Percent<br>Rejected |
|--------------------|----------------------|--------------------|---------------------|-----------------|------------------|----------------------|-----------------------|--------------------|---------------------|
| Gross Alpha        | 15                   | 0                  | 0                   | 0               | ****             | 0                    | ****                  | 0                  | ****                |
| Gross Beta         | 15                   | 0                  | 0                   | 0               | ****             | 0                    | ****                  | 0                  | ****                |
| Uranium 233, 234   | 15                   | 0                  | 0                   | 0               | ****             | 0                    | ****                  | 0                  | ****                |
| Uranium 235        | 15                   | 0                  | 0                   | 0               | ****             | 0                    | ****                  | 0                  | ****                |
| Uranium 238        | 15                   | 0                  | 0                   | 0               | ****             | 0                    | ****                  | 0                  | ****                |
| Strontium 89, 90   | 15                   | 0                  | 0                   | 0               | ****             | 0                    | ****                  | 0                  | ****                |
| Plutonium 239, 240 | 15                   | 0                  | 0                   | 0               | ****             | 0                    | ****                  | 0                  | ****                |
| Americium 241      | 10                   | 0                  | 0                   | 0               | ****             | 0                    | ****                  | 0                  | ****                |
| Cesium 137         | 15                   | 0                  | 0                   | 0               | ****             | 0                    | ****                  | 0                  | ****                |
| Tritium            | 15                   | 0                  | 0                   | 0               | ****             | 0                    | ****                  | 0                  | ****                |
| Radium 226         | 15                   | 0                  | 0                   | 0               | ****             | 0                    | ****                  | 0                  | ****                |
| Radium 228         | 15                   | 0                  | 0                   | 0               | ****             | 0                    | ****                  | 0                  | ****                |

Reviewed = Validation review conducted

SURFACE WATER  
TOTAL RADIONUCLIDES  
DATA VALIDATION SUMMARY

| Analyte            | Number of Results | Number Reviewed | Percent Reviewed | Number Valid | Percent Valid | Number Acceptable | Percent Acceptable | Number Rejected | Percent Rejected |
|--------------------|-------------------|-----------------|------------------|--------------|---------------|-------------------|--------------------|-----------------|------------------|
| Gross Alpha        | 58                | 6               | 10               | 0            | 0             | 0                 | 0                  | 6               | 100              |
| Gross Beta         | 58                | 6               | 10               | 0            | 0             | 0                 | 0                  | 6               | 100              |
| Uranium 233, 234   | 58                | 9               | 16               | 9            | 100           | 0                 | 0                  | 0               | 0                |
| Uranium 235        | 58                | 9               | 16               | 9            | 100           | 0                 | 0                  | 0               | 0                |
| Uranium 238        | 58                | 9               | 16               | 9            | 100           | 0                 | 0                  | 0               | 0                |
| Strontium 89, 90   | 58                | 0               | 0                | 0            | ****          | 0                 | ****               | 0               | ****             |
| Plutonium 239, 240 | 58                | 9               | 16               | 8            | 89            | 1                 | 11                 | 0               | 0                |
| Americium 241      | 52                | 9               | 17               | 3            | 33            | 2                 | 22                 | 4               | 44               |
| Cesium 137         | 58                | 0               | 0                | 0            | ****          | 0                 | ****               | 0               | ****             |
| Iritium            | 54                | 0               | 0                | 0            | ****          | 0                 | ****               | 0               | ****             |
| Radium 226         | 16                | 0               | 0                | 0            | ****          | 0                 | ****               | 0               | ****             |
| Radium 228         | 5                 | 0               | 0                | 0            | ****          | 0                 | ****               | 0               | ****             |

Reviewed = Validation review conducted

SURFACE WATER  
DISSOLVED RADIONUCLIDES  
DATA VALIDATION SUMMARY

| Analyte            | Number of<br>Results | Number<br>Reviewed | Percent<br>Reviewed | Number<br>Valid | Percent<br>Valid | Number<br>Acceptable | Percent<br>Acceptable | Number<br>Rejected | Percent<br>Rejected |
|--------------------|----------------------|--------------------|---------------------|-----------------|------------------|----------------------|-----------------------|--------------------|---------------------|
| Gross Alpha        | 10                   | 0                  | 0                   | 0               | ****             | 0                    | ****                  | 0                  | ****                |
| Gross Beta         | 10                   | 0                  | 0                   | 0               | ****             | 0                    | ****                  | 0                  | ****                |
| Uranium 233, 234   | 10                   | 0                  | 0                   | 0               | ****             | 0                    | ****                  | 0                  | ****                |
| Uranium 235        | 10                   | 0                  | 0                   | 0               | ****             | 0                    | ****                  | 0                  | ****                |
| Uranium 238        | 10                   | 0                  | 0                   | 0               | ****             | 0                    | ****                  | 0                  | ****                |
| Strontium 89, 90   | 10                   | 0                  | 0                   | 0               | ****             | 0                    | ****                  | 0                  | ****                |
| Plutonium 239, 240 | 10                   | 0                  | 0                   | 0               | ****             | 0                    | ****                  | 0                  | ****                |
| Americium 241      | 10                   | 0                  | 0                   | 0               | ****             | 0                    | ****                  | 0                  | ****                |
| Cesium 137         | 10                   | 0                  | 0                   | 0               | ****             | 0                    | ****                  | 0                  | ****                |
| Tritium            | 0                    | 0                  | ****                | 0               | ****             | 0                    | ****                  | 0                  | ****                |
| Radium 226         | 0                    | 0                  | ****                | 0               | ****             | 0                    | ****                  | 0                  | ****                |
| Radium 228         | 0                    | 0                  | ****                | 0               | ****             | 0                    | ****                  | 0                  | ****                |

Reviewed = Validation review conducted

GROUND WATER  
DISSOLVED RADIONUCLIDES  
DATA VALIDATION SUMMARY

| Analyte            | Number of Results | Number Reviewed | Percent Reviewed | Number Valid | Percent Valid | Number Acceptable | Percent Acceptable | Number Rejected | Percent Rejected |
|--------------------|-------------------|-----------------|------------------|--------------|---------------|-------------------|--------------------|-----------------|------------------|
| Gross Alpha        | 100               | 3               | 3                | 0            | 0             | 0                 | 0                  | 3               | 100              |
| Gross Beta         | 100               | 3               | 3                | 0            | 0             | 0                 | 0                  | 3               | 100              |
| Uranium 233, 234   | 98                | 3               | 3                | 2            | 67            | 1                 | 33                 | 0               | 0                |
| Uranium 235        | 98                | 3               | 3                | 2            | 67            | 1                 | 33                 | 0               | 0                |
| Uranium 238        | 98                | 3               | 3                | 2            | 67            | 1                 | 33                 | 0               | 0                |
| Strontium 89, 90   | 97                | 2               | 2                | 2            | 100           | 0                 | 0                  | 0               | 0                |
| Plutonium 239, 240 | 90                | 3               | 3                | 3            | 100           | 0                 | 0                  | 0               | 0                |
| Americium 241      | 77                | 3               | 4                | 1            | 33            | 0                 | 0                  | 2               | 67               |
| Cesium 137         | 97                | 2               | 2                | 1            | 50            | 1                 | 50                 | 0               | 0                |
| Tritium            | 103               | 1               | 1                | 1            | 100           | 0                 | 0                  | 0               | 0                |
| Radium 226         | 24                | 0               | 0                | 0            | ****          | 0                 | ****               | 0               | ****             |
| Radium 228         | 0                 | 0               | ****             | 0            | ****          | 0                 | ****               | 0               | ****             |

Reviewed = Validation review conducted

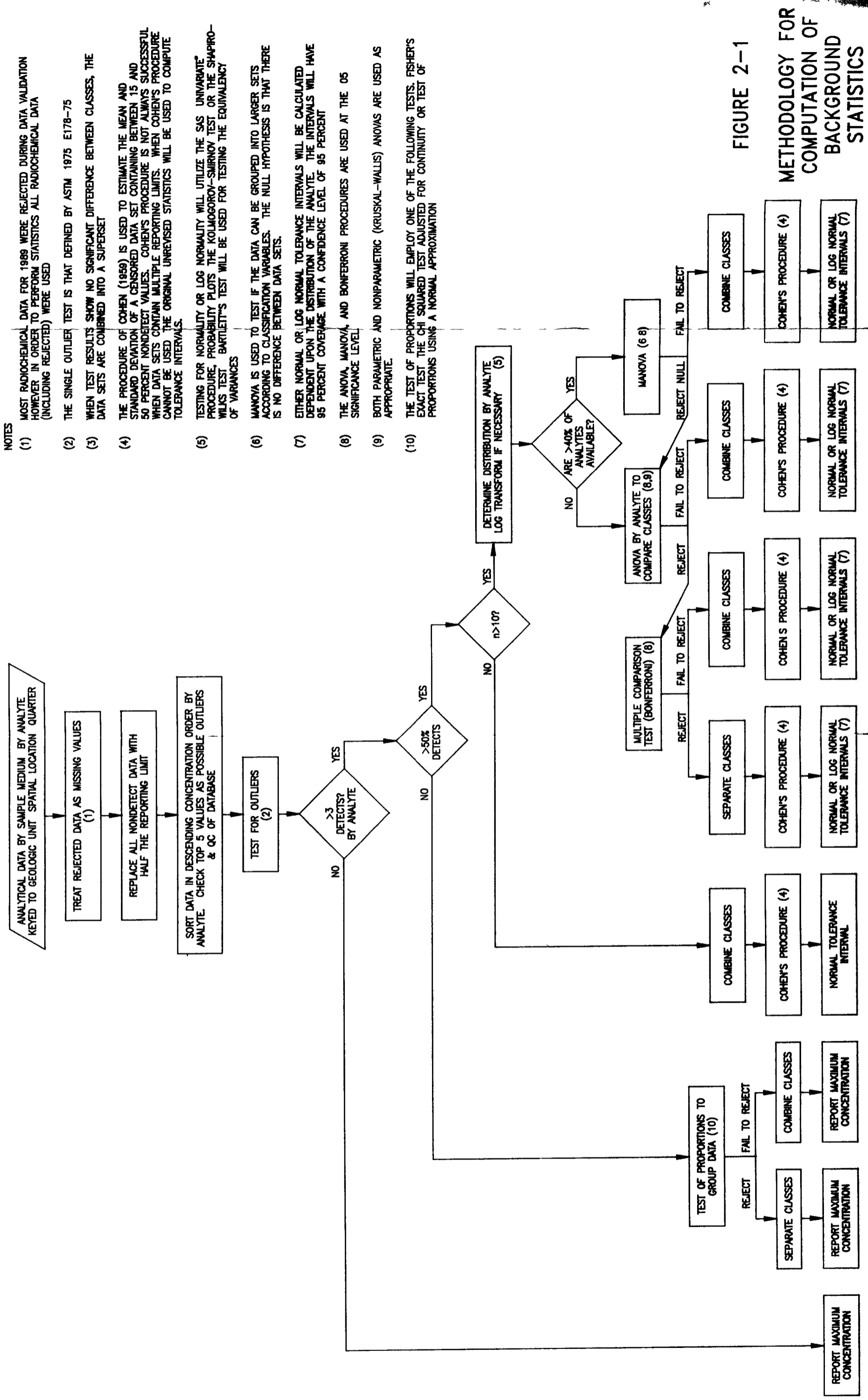


FIGURE 2-1  
METHODOLOGY FOR  
COMPUTATION OF  
BACKGROUND  
STATISTICS

NOTES

- (1) MOST RADIOCHEMICAL DATA FOR 1989 WERE REJECTED DURING DATA VALIDATION HOWEVER IN ORDER TO PERFORM STATISTICS ALL RADIOCHEMICAL DATA (INCLUDING REJECTED) WERE USED
- (2) THE SINGLE OUTLIER TEST IS THAT DEFINED BY ASTM 1975 E178-75
- (3) WHEN TEST RESULTS SHOW NO SIGNIFICANT DIFFERENCE BETWEEN CLASSES, THE DATA SETS ARE COMBINED INTO A SUPERSET
- (4) THE PROCEDURE OF COHEN (1959) IS USED TO ESTIMATE THE MEAN AND STANDARD DEVIATION OF A CENSORED DATA SET CONTAINING BETWEEN 15 AND 50 PERCENT NONDETECT VALUES. COHEN'S PROCEDURE IS NOT ALWAYS SUCCESSFUL WHEN DATA SETS CONTAIN MULTIPLE REPORTING LIMITS. WHEN COHEN'S PROCEDURE CANNOT BE USED THE ORIGINAL UNREVISED STATISTICS WILL BE USED TO COMPUTE TOLERANCE INTERVALS.
- (5) TESTING FOR NORMALITY OR LOG NORMALITY WILL UTILIZE THE SAS UNIVARIATE PROCEDURE, PROBABILITY PLOTS THE KOLMOGOROV-SMIRNOV TEST OR THE SHAPIRO-WILKS TEST. BARTLETT'S TEST WILL BE USED FOR TESTING THE EQUIVALENCY OF VARIANCES
- (6) MANOVA IS USED TO TEST IF THE DATA CAN BE GROUPED INTO LARGER SETS ACCORDING TO CLASSIFICATION VARIABLES. THE NULL HYPOTHESIS IS THAT THERE IS NO DIFFERENCE BETWEEN DATA SETS.
- (7) EITHER NORMAL OR LOG NORMAL TOLERANCE INTERVALS WILL BE CALCULATED DEPENDENT UPON THE DISTRIBUTION OF THE ANALYTE. THE INTERVALS WILL HAVE 95 PERCENT COVERAGE WITH A CONFIDENCE LEVEL OF 95 PERCENT
- (8) THE ANOVA, MANOVA, AND BONFERRONI PROCEDURES ARE USED AT THE 05 SIGNIFICANCE LEVEL
- (9) BOTH PARAMETRIC AND NONPARAMETRIC (KRUSKAL-WALLIS) ANOVAS ARE USED AS APPROPRIATE.
- (10) THE TEST OF PROPORTIONS WILL EMPLOY ONE OF THE FOLLOWING TESTS. FISHER'S EXACT TEST THE CHI SQUARED TEST ADJUSTED FOR CONTINUITY OR TEST OF PROPORTIONS USING A NORMAL APPROXIMATION

ROCKY FLATS PLANT  
Golden, Colorado  
**PLATE 3**  
STIFF DIAGRAMS FOR BACKGROUND GROUND-WATER  
AND SURFACE WATER SAMPLES

Y E.G. ROCKY FLATS

